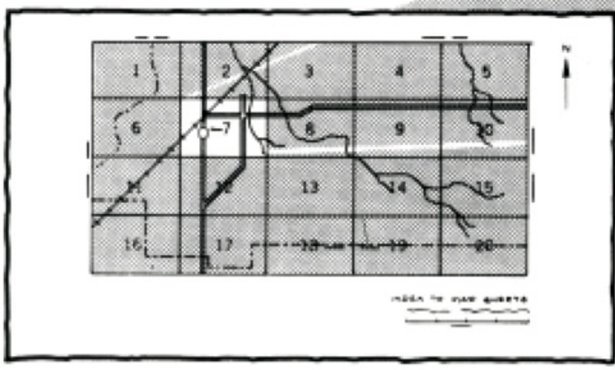
SOIL SURVEY OF

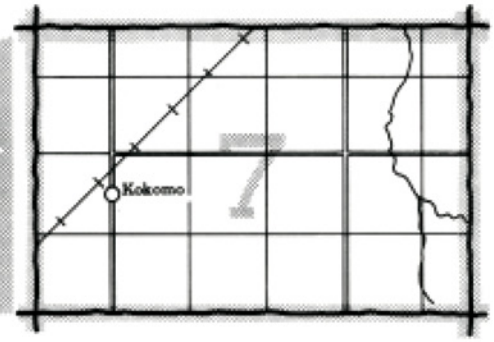
Gosper County, Nebraska

United States Department of Agriculture
Soil Conservation Service
in cooperation with
University of Nebraska Conservation and Survey Division

HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"





2. Note the number of the map sheet and turn to that sheet.

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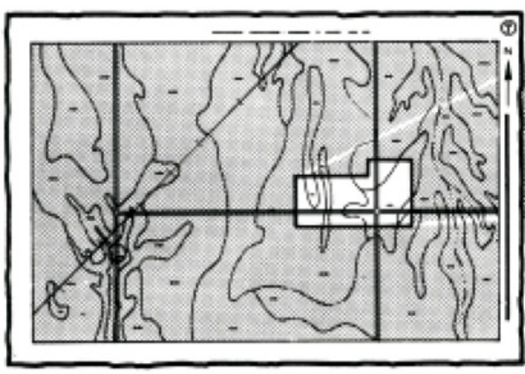
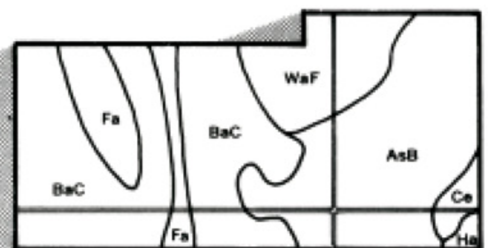
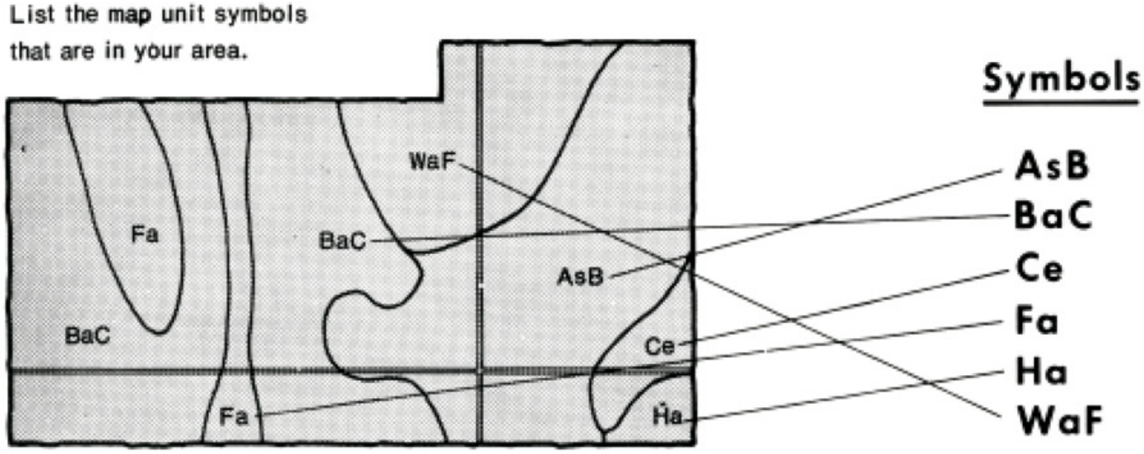


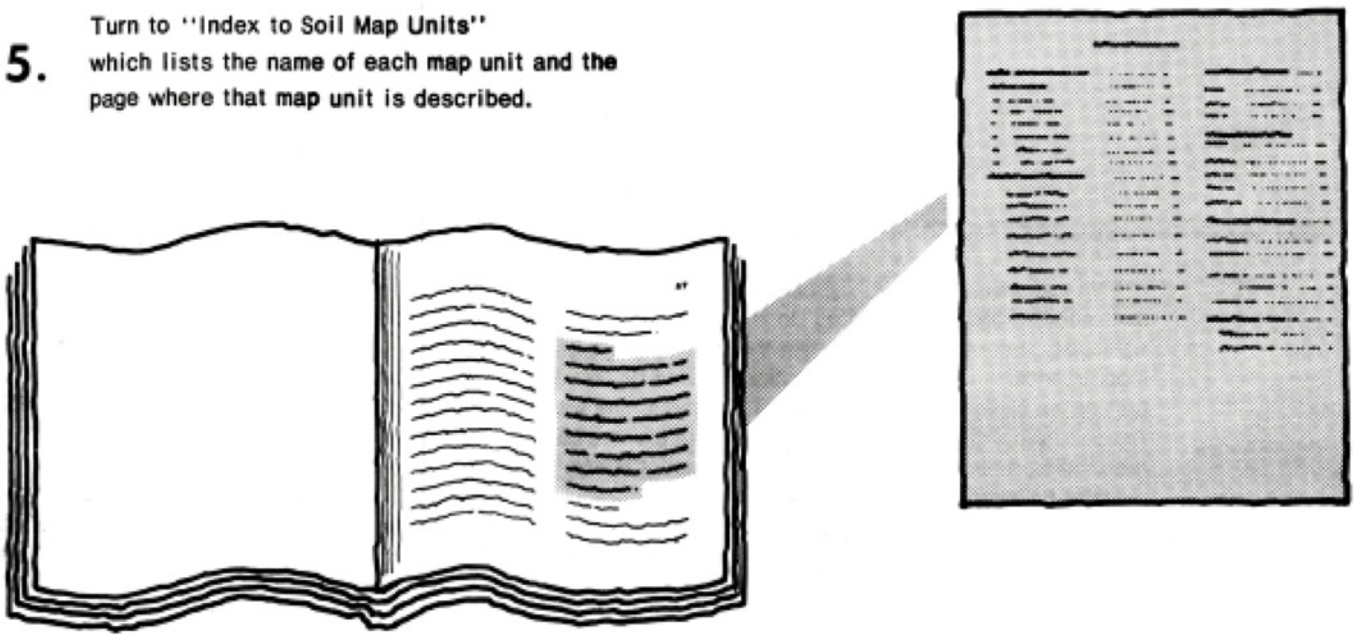


4. List the map unit symbols that are in your area.

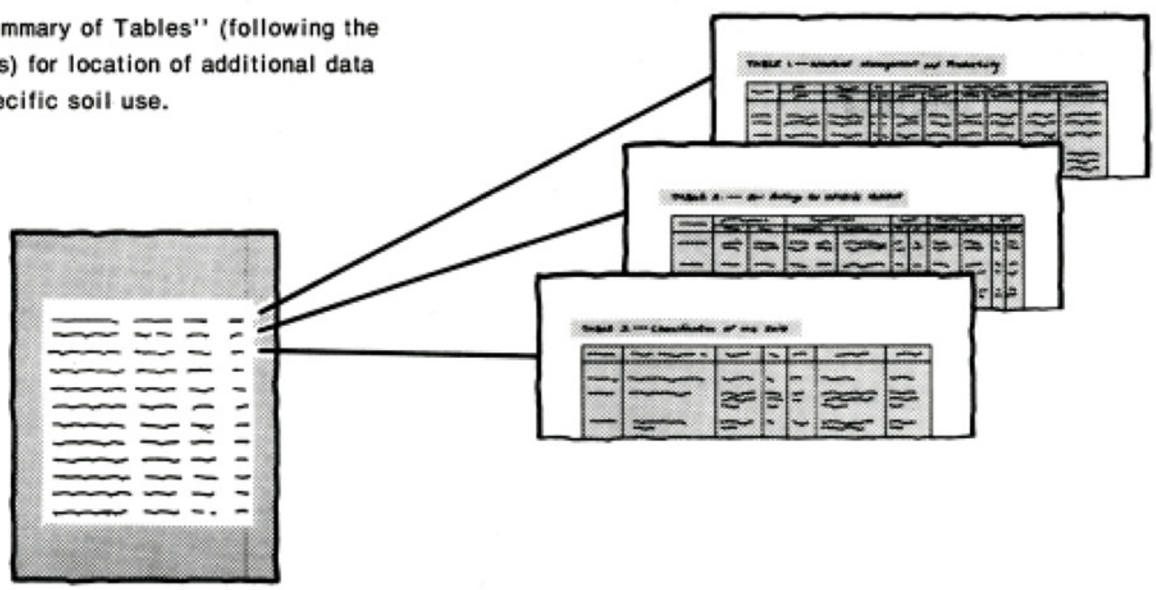


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies and state agencies. In this survey, the Tri-Basin Natural Resources District contributed funds for fieldwork and the Gosper County Commissioners furnished funds for aerial photography. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service and the University of Nebraska, Conservation and Survey Division. It is part of the technical assistance furnished to the Tri-Basin Natural Resources District. Major fieldwork was performed in the period 1974-78. Soil names and descriptions were approved in 1978. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: An area of the nearly level and very gently sloping Holdrege soils. The strongly sloping to very steep Coly soils are in the background.

contents

soil series

Issued February 1981

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foreword

This soil survey contains information that can be used in land-planning programs in Gosper County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service, the Tri-Basin Natural Resources District, or the Cooperative Extension Service.

Benny Martin
State Conservationist
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soil survey of
Gosper County, Nebraska

By Frank E. Wahl, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service,
in cooperation with
University of Nebraska, Conservation and Survey Division

GOSPER COUNTY is in south-central Nebraska (fig. 1). It has a total land area of about 295,604 acres, or 462 square miles. The distance from the eastern boundary to the western boundary generally is 18 miles but is 24 miles in the southern tier of townships. The distance from the southern boundary to the northern boundary generally is 24 miles, but the extreme northeast boundary is irregular because it follows the channel of the Platte River.

The total population of Gosper County was about 2,400 in 1974. Elwood, which has a population of about 700, and Smithfield, which has one of about 60, are the only incorporated towns. Elwood is the county seat. It is at the junction of State Highway 23 and U.S. Highway 283, about 16 miles south of Interstate 80 and 190 miles west of Lincoln. Smithfield is about 7 miles east of Elwood on State Highway 23. Both towns are served by a railroad that extends southeast to northwest across the northern half of the county. U.S. Highway 283 extends through the center of the county from south to north. It is an important paved route from U.S. Highway 30 and Interstate 80 to U.S. Highways 6 and 34. State Highway 23, a good paved highway, extends northwest to southeast across the northern part of the county. Much of it is along the railroad.

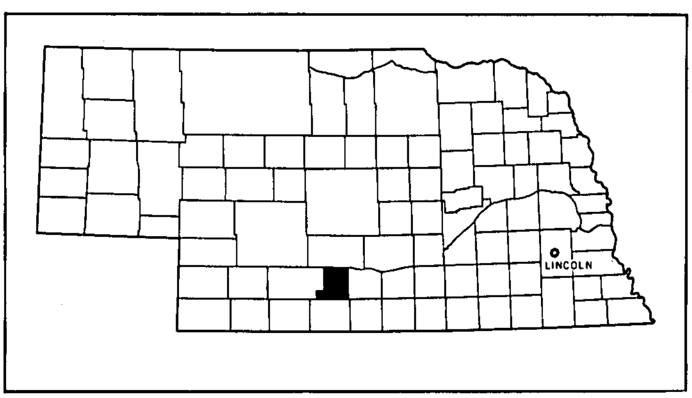

Figure 1.—Location of Gosper County in Nebraska.

Farming is the leading occupation. Most of the employment in the county is in farm enterprises or related businesses. Small industries in Elwood employ a few workers. Some residents of Gosper County are employed by industries in Cozad and Lexington, in neighboring Dawson County.

Most farm enterprises combine cash grain crops and livestock production. Corn, alfalfa, small grain, and grain sorghum are grown extensively on the more productive soils. According to data collected by the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, in 1978, about 50 percent of the land area is cropland and more than 45 percent is rangeland. The rest is used for farmsteads, towns, and other purposes. About 46 percent of the cropland is irrigated. The main crops are corn and alfalfa. They are fed to cattle and hogs or sold for cash income.

Rangeland commonly is a part of individual farm units. Separated by gently sloping divides that are used for crops, the steeper canyons support native grass and are grazed, commonly by beef cattle. The only areas that are dominantly cropland are the gently undulating loess-covered plains in the northeastern part of the county and, in the northeast corner, the small area of stream terraces in the valley of the Platte River.

Two reservoirs impound water in the county. These are Johnson Lake, which has a surface area of about 1,400 acres in Gosper County, and Elwood Reservoir, which has a surface area of about 1,300 acres. Johnson Lake is on the northern boundary of the county and is north of Plum Creek. Elwood Reservoir is south of Plum Creek. Both of the reservoirs provide water for irrigation in the northern part of the county. They also provide opportunities for recreation. A number of permanent residences and several business enterprises are established around Johnson Lake.

Most of the soils in Gosper County are on uplands. They are silty soils that formed in loess. In a small area in the north-central part, the soils formed in loamy eolian material. Water erosion and soil blowing are the principal hazards on the upland soils. An insufficient amount of rainfall for crops is a concern during most growing seasons. Measures that conserve water by controlling runoff and measures that maintain the fertility level of the soils are the chief management needs. A properly designed irrigation system that applies water efficiently also is important.

The soils in the valley of the Platte River and along the larger creeks formed in alluvial and colluvial material. Flooding and the wetness caused by a seasonal high water table are management concerns on some of these soils. Measures that control soil blowing and improve tilth and fertility are important management needs.

This survey updates the soil survey of Gosper County that was published in 1938 (*3*). It provides additional information and larger maps, which show the soils in greater detail.

general nature of the county

This section provides general information about Gosper County. It describes the history and development, the physiography, relief, and drainage, the geology, the ground water, and the climate.

history and development

A natural habitat for buffalo, the area now known as Gosper County was at one time used by the Pawnees as summer hunting grounds. Hunting parties forded the Platte River from the north at Plum Creek and hunted in areas to the south and west (*4*).

Cattlemen began to use the resources of the area toward the end of the nineteenth century. The free, open range supplied good summer and fair winter grazing, and the steep canyons sheltered the cattle during winter storms. Water was easily available along the larger streams (*3*).

Settlement was slow before 1870. The only settlers were those who helped to support travel on the Oregon Trail, along the Platte River. One of the first settlers was a man named Humphries, who ran a pony express station near Plum Creek. According to land office records, the first homesteader in the county was Parker L. Wise, who filed for a tract in T. 5 N., R. 23 W., in April 1872. The claims generally were in the southern part of the county, where the supply of water from natural springs was abundant, game was plentiful, and some timber was available. The county was organized in the summer of 1873. The county seat was Daviesville, on Muddy Creek, until 1884. It was moved to Homerville in 1884 and to Elwood in the spring of 1889 (*3, 4*).

The county established eight school districts by 1879. School houses were built in six of the districts. Four of these were sod houses. The county had 69 school districts in 1900. As farms grew larger and the number of students smaller, the districts consolidated. The number of districts was reduced to eight by 1960 and to five by 1969 (*4*). In 1978, the Elwood Schools and one rural elementary school were the only schools in districts completely within the county. Five high schools and one elementary school in adjacent counties include areas of Gosper County in their districts.

Railroad lines were constructed through Smithfield and Elwood in 1885 (*4*). They stimulated the development of farm enterprises. By 1890, much of the smoother land had been converted from rangeland to cropland and the cattlemen were replaced by farmers who grew grain and raised livestock. About 101,000 acres was used for corn in 1929. Since that year, the total acreage used for cultivation has not increased significantly.

The railroad also stimulated the development of other enterprises. A roundhouse was built west of Elwood late in the 1880's. During this period Elwood had three lumber yards, two hotels, a general store, and a mill. Later, a farm machinery dealership and other enterprises related to farming were established in the county. Elevators were built in the early 1890's. The first was at Smithfield (*4*).

The county is served by three power plants in the Johnson Lake area. Two of these are hydroelectric plants on the Phelps County Canal in the northeastern part of Gosper County. Each has a capacity of 18,000 kilowatts per hour. The third is the Canaday Steam Plant, which has a capacity of 100,000 kilowatts per hour.

Fuel, fertilizers, and other supplies are sold by local businesses. The goods or services of a large farm machinery dealer, building contractors, earthmoving contractors, an irrigation equipment dealer, and a driller of irrigation wells are available. Grain is fed to livestock or sold through local elevators. Most livestock sales are through auction markets in adjacent counties. Some

fattened cattle and hogs are shipped to terminal markets in Omaha or sold directly to packers in nearby counties.

Cropping systems and tillage practices gradually changed after the drought of the 1930's. They are designed to cope with the hazards of soil blowing and water erosion. Contour farming, terraces, windbreaks, and a conservation tillage system that leaves crop residue on the surface commonly reduce these hazards.

Irrigation significantly changed farming systems. It increased crop production by reducing the effects of drought. Wells supply water to all parts of the county, and canals to the northern part. Since 1941, the Tri-County system of canals and reservoirs has provided water to areas north and east of Smithfield. In 1955, it provided irrigation water for about 10,000 acres in the county. In 1978, the Elwood Reservoir, north of Elwood, was completed. It provides additional irrigation water.

Deep wells supply the largest amount of irrigation water in the county. The first wells, which were generally shallow, were dug in the valley of the Platte River early in the 1950's. In 1958, 125 wells provided irrigation water for about 10,000 acres. The number of wells increased to 374 by 1975. The number of center-pivot systems increased from 7 in 1972 to 24 in 1976. According to the Conservation Needs Inventory, about 33,000 acres was irrigated in 1967. According to the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, about 64,000 acres was irrigated in 1976.

physiography, relief, and drainage

Gosper County is in the Central Plains section of the Great Plains physiographic province. Most of the county is in the Rolling Plains and Breaks Land Resource Area of Nebraska. The Central Loess Plains Area extends into the northeastern part of the county.

The county was once an eastward and southward sloping, loess-mantled plain that ranged from smooth to rolling. Erosion of the loess deposit has resulted in dominantly strong relief. The deeply entrenched drainageways have dissected the plain into alternating steep canyons and high, gently sloping divides.

The northern part of the county generally is covered with silty loess. A small transitional area, however, is covered with mixed loamy and sandy eolian material. This area is along the south side of Johnson Lake, from which it extends southeast nearly to Plum Creek.

The northeast corner of the county is in the valley of the Platte River. This area is about 3,800 acres in size. The landscape occurs as stream terraces and bottom land.

The landscape in the northeastern and east-central parts of the county generally is a nearly level or gently undulating plain covered by silty loess. This is an area of about 50 square miles. Storm water accumulates in the many scattered shallow depressions in this area, and the drainage pattern is poorly defined. The soils on the smooth, loess-covered plains are very productive. Most areas are irrigated. Erosion generally occurs in these areas when irrigation or storm water drains into the adjacent canyons.

The county is in two major drainage basins. In the northern third, water drains through Plum Creek and its tributaries into the Platte River to the east. In the southern two-thirds, water drains southward through tributaries of the Republican River, mainly Turkey, Elk, Muddy, and Deer Creeks. These begin as intermittent drainageways in the uplands to the north. In the southern half of the county, however, water flows constantly in most of these drainageways. This water occurs as seepage from a water table or as water from springs. Most of it flows from a sand sheet underlying the loess. Many of the soils in the county are well drained or excessively drained because of rapid runoff in areas where sharp ridges and steep slopes are common.

Elevation ranges from 2,697 feet above sea level in the northwestern part of the county, near Frontier County, to about 2,300 feet on the southern county line. Elwood, which is nearly on the divide between the Republican River and Platte River watersheds, is at an elevation of 2,680 feet.

geology

The Ogallala Formation of Pliocene age underlies the entire county but does not crop out. It is an important source of ground water throughout the county. It consists of sandstone and conglomerate cemented with calcium carbonate or opaline silica, unconsolidated sand and gravel, loesslike silt, and volcanic ash. It ranges in thickness from less than 50 feet in the southwestern part of the county to more than 300 feet in the north-central part.

Overlying the Ogallala Formation are sand, gravel, and silt of Pleistocene age. The sand and gravel are an important source of ground water, and the more recently deposited silt, which is Peoria loess and Bignell loess, is the parent material in which many of the modern soils formed.

The most recent deposit is the alluvium on the flood plains along streams. The alluvium generally washed in from the loess-mantled uplands, but in the valley of the Platte River it includes sand and gravel from outside the area.

Gosper County is part of an upland plain that has been dissected by tributaries of the Platte and Republican Rivers. Small remnants of the original plain are evident north and south of Plum Creek. They are broad, nearly level divides characterized by many small and a few large depressions and swales. Flat-topped divides less than 1 mile wide are evident between the long drainageways that extend from the valley of the Republican River to the divide.

The soils are thick and dark on the flat-topped divides and on the remnants of the original plain. Some formed in Peoria loess and in the thin mantle of Bignell loess,

which is several feet thick near the valley of the Platte River but thins out within short distances to the south. Soils that have a weakly expressed profile and a thin surface layer are on the steep slopes that border the flat-topped divides. Most of the soils on the steep slopes throughout the county formed in Peoria loess. On the steep slopes along some of the more deeply incised drainageways, the reddish brown Loveland Formation crops out and, on a few of the lower slopes, the silts, clays, and sands of the Sappa Formation. In some areas these formations crop out for miles along the drainageways, but the soils that formed in material derived from the formations occur as bands too narrow to be shown separately on the soil maps.

ground water

Ample supplies of ground water for domestic use and for livestock can be obtained throughout the county from the unconsolidated deposits of Pleistocene age or from the Ogallala Formation of Pliocene age. In most of the rural areas the water is drawn from small-diameter wells equipped with electric pumps that deliver 5 to 20 gallons per minute.

Water for public use, industry, and irrigation is drawn from the Ogallala Formation and from the overlying sand and gravel. Because the Ogallala Formation is only moderately permeable, the wells should be drilled a considerable depth through water-bearing material if large yields are to be obtained. The sand and gravel deposits are much more permeable and can yield a large amount of water. They occur in scattered areas throughout the county. The potential for large yields is low, however, in the southwestern part of the county because both the Ogallala Formation and the overlying layer of sand and gravel are thin, if they occur, and shale of Cretaceous age is near the surface.

The water from the Ogallala Formation is similar in mineral concentration to the water from the overlying sand and gravel. Both are the calcium-bicarbonate type in which the dissolved mineral content ranges from 350 to 400 parts per million. Chemically, the ground water is suitable for irrigation, public use, industry, and domestic use, but it is very hard and in some wells has iron concentrations that are high enough to be troublesome if the water is used for certain industrial and domestic purposes. The concentrations of sodium, boron, and selenium are below the troublesome level.

Hard water is objectionable when clothes are laundered because in combination with soap it forms an insoluble curd. Also, more soap is needed to produce suds. The hard water forms a scale in boilers, water heaters, radiators, and pipes and thus reduces efficiency. The abundance of calcium and magnesium in this water counteracts the adverse effect of bicarbonate concentrations, and no unfavorble soil conditions are likely to result if the water is used for irrigation. Iron is objectionable in a domestic or public water supply because it stains plumbing fixtures, discolors or stains clothes in the wash, and forms a rusty scale in pipes.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

In Gosper County winters are cold because of frequent incursions of cold continental air. Summers are hot but occasionally are interrupted by cool spells when the air is from the north. Snow falls frequently in winter, but the snow cover usually is not continuous. Rainfall is heaviest late in spring and early in summer. The annual precipitation normally is adequate for wheat, sorghum, and range grasses.

Table 1 gives data on temperature and precipitation for the survey area as recorded at the Canaday Steam Plant in the period 1961 to 1976. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 27 degrees F, and the average daily minimum temperature is 15 degrees. The lowest temperature on record, which occurred at the Canaday Steam Plant on January 12, 1974, is minus 20 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred on July 23, 1964, is 107 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 17 inches, or 80 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 13 inches. The heaviest 1-day rainfall during the period of record was 3.98 inches on July 23, 1968. Thunderstorms occur on about 50 days each year, and most occur in summer.

Average seasonal snowfall is 22 inches. The greatest snow depth at any one time during the period of record was 15 inches. On an average of 37 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 50 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 60 percent in winter. The prevailing wind is from the northwest. Average windspeed is highest, 12 miles per hour, in spring.

Severe duststorms occasionally occur in spring when strong, dry winds blow over unprotected soils. Tornadoes

and severe thunderstorms, sometimes accompanied by hail, occur occasionally. These storms are local in extent and of short duration. They cause damage in scattered areas.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers and ranchers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

soil descriptions

1. Holdrege-Uly-Coly association

Deep, very gently sloping to steep, well drained and somewhat excessively drained, silty soils formed in loess on uplands

This association consists of very gently sloping and gently sloping soils in long, smooth areas on high divides and strongly sloping to steep soils on side slopes and along intermittent drainageways.

This association occupies about 109,254 acres, or about 37 percent of the county. It is about 46 percent Holdrege soils, 27 percent Uly soils, 20 percent Coly soils, and 7 percent minor soils (fig. 2).

The Holdrege soils are in long, smooth areas on divides. They are very gently sloping and gently sloping and are well drained. Typically, the surface soil is dark grayish brown, very friable silt loam about 12 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray silty clay loam about 11 inches thick. The underlying material to a depth of 60 inches is light gray silt loam.

The Uly soils are in smooth areas on divides and on long, smooth side slopes along intermittent drainageways. They are strongly sloping on the divides and moderately steep along the drainageways. They are well drained and somewhat excessively drained. Typically, the surface soil is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is silt loam about 11 inches thick. The upper part is dark grayish brown, and the lower part is grayish brown. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

The Coly soils are in eroded areas on divides and on side slopes along intermittent drainageways. They are strongly sloping to steep and are well drained and somewhat excessively drained. Typically, the surface soil is grayish brown, friable silt loam about 5 inches thick. The underlying material to a depth of 60 inches is light brownish gray and light gray, calcareous silt loam.

Minor in this association are Hobbs and Hall soils. Hobbs soils are on the narrow bottoms of drainageways. They commonly are cut by deep meandering channels. Hall soils are slightly lower on the landscape than the Holdrege soils.

Farms on this association are diversified, mainly a combination of cash grain and livestock enterprises. The very gently sloping and gently sloping soils in the smoother areas on divides generally are used for cultivated crops. The soils on side slopes and along drainageways support native grass and are used for grazing. Many of the cultivated areas are irrigated. The main irrigated crops are corn and alfalfa. A few areas are used for irrigated pasture. The main dryland crops are wheat, grain sorghum, and some alfalfa and other forage crops. Cattle winter on the forage crops.

Deep wells supply the irrigation water. Because the amount of ground water varies greatly within short distances, several tests generally are needed to determine suitable sites for the wells. The yield from individual wells ranges from more than 1,000 to less than 400 gallons per minute. In most areas the yield is adequate for watering livestock.

Water erosion and soil blowing are the main hazards in farmed areas. In the areas managed for dryland crops, an insufficient amount of rainfall is the main limitation. Distributing an adequate amount of irrigation water and, at the same time, adequately controlling erosion are the chief concerns in managing irrigated areas. A planned grazing system that includes proper grazing use, properly designed dams that provide water to livestock, and measures that control water erosion are needed on rangeland.

Farms on this association average about 1,100 acres. A few are more than 2,000 acres. Gravel or improved dirt roads are along many section lines, but they are not along all section lines. They are not needed along all

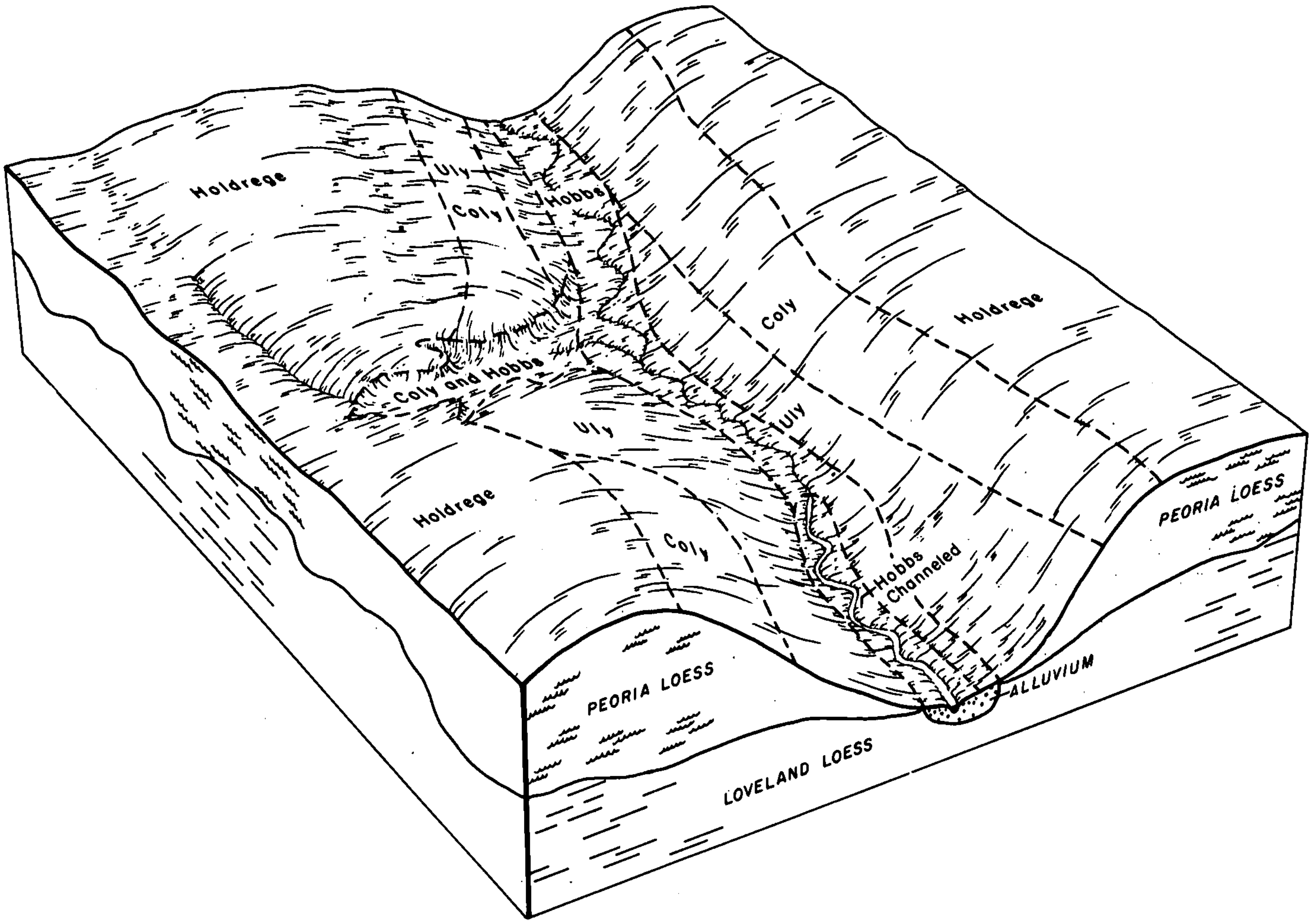

Figure 2.—Typical pattern of soils and parent material in the Holdrege-Uly-Coly association.

section lines because many north-south roads are constructed on the smoother divides between canyons. A few good gravel roads that cross the steep canyons from east to west provide generally adequate access to grain and livestock markets. One paved highway crosses the association from north to south. Some cash grain is sold within the county, but much is sold to elevators in adjacent counties. Most of the livestock is marketed at auctions outside the county or is shipped to terminal markets.

2. Holdrege-Hall association

Deep, nearly level and very gently sloping, well drained, silty soils formed in loess on uplands

This association consists mainly of nearly level and very gently sloping soils in smooth areas on uplands. It occupies about 69,000 acres, or about 23 percent of the county. It is about 70 percent Holdrege soils, 26 percent Hall soils, and 4 percent minor soils (fig. 3).

The Holdrege soils are in long, smooth areas. Typically, the surface soil is friable silt loam about 14 inches thick. It is grayish brown in the upper part and dark grayish brown in the lower part. The subsoil is silty clay loam about 10 inches thick. It is grayish brown in the upper part and brown in the lower part. The underlying material to a depth of 60 inches is pale brown silt loam.

The Hall soils are in smooth areas at the slightly lower elevations. Typically, the surface soil is dark grayish brown, friable silt loam about 14 inches thick. The subsoil is silty clay loam about 26 inches thick. It is dark grayish brown in the upper part and grayish brown in the lower part. The underlying material to a depth of 60 inches is light brownish gray and light gray silt loam.

Minor in this association are Fillmore and Scott soils. Fillmore soils are in broad, shallow upland depressions. Scott soils are in well defined upland depressions.

Most of the farms on this association are used for cash grain crops. Corn, grain sorghum, wheat, and alfalfa

are the main crops. Most cropped areas are irrigated. A plentiful supply of water is available from wells and canals. Wheat is the main dryland crop. Most of the pastures on this association are small. Some livestock is fattened and marketed.

The hazard of water erosion is slight or moderate in the very gently sloping areas. In the areas managed for dryland crops, an insufficient amount of rainfall is the main limitation and soil blowing is a hazard unless a plant cover protects the surface. In irrigated areas timely application and proper distribution of irrigation water are needed. Maintaining fertility is a management concern.

Farms on this association average about 640 acres. Gravel and improved dirt roads are along most section lines. The highways that cross the association are paved. Most of the farm produce is marketed in the county or in adjacent counties.

3. Uly-Coly association

Deep, strongly sloping to steep, well drained and somewhat excessively drained, silty soils formed in loess on uplands

This association consists of strongly sloping and moderately steep soils on divides and moderately steep and steep soils on side slopes that border intermittent drainageways in the uplands (fig. 4).

This association occupies about 52,000 acres, or about 18 percent of the county. It is about 45 percent Uly soils, 41 percent Coly soils, and 14 percent minor soils (fig. 5).

The Uly soils are strongly sloping and moderately steep and are on ridges and on dominantly convex side slopes. Typically, the surface soil is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is silt loam about 14 inches thick. The upper part is grayish brown, and the lower part is light grayish brown. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

The Coly soils are on high lying, narrow ridgetops and the steeper side slopes. Typically, the surface soil is brown, very friable silt loam about 3 inches thick. The underlying material to a depth of 60 inches is pale brown and very pale brown, calcareous silt loam.

Minor in this association are Hobbs, Hord, and Holdrege soils. Hobbs soils are on the narrow bottoms of small drainageways. The nearly level and very gently sloping Hord soils are on foot slopes and on benches above the drainageways. The nearly level to gently sloping Holdrege soils are on ridgetops.

Most of this association supports native grass and is used for livestock ranches or farms. Cow-calf enterprises are dominant. A few farmers or ranchers fatten calves

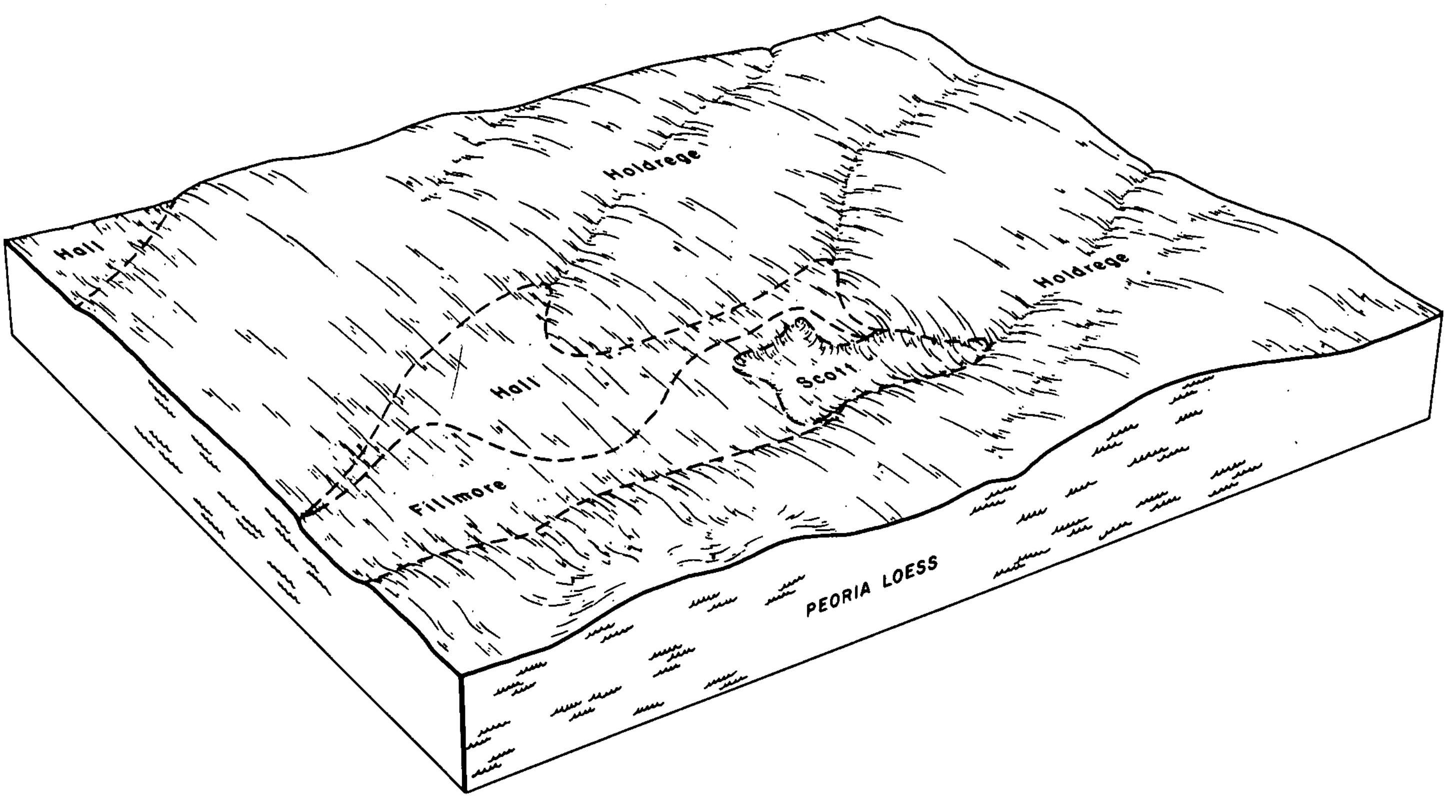

Figure 3.—Typical pattern of soils and parent material in the Holdrege-Hall association.

Figure 4.—An area of the Uly-Coly association. The moderately steep Uly soils are on the divides, and the steep Coly soils are on the short slopes.

on the grass. The steepest areas are used as rangeland. The wider alluvial drainageways and less sloping ridges are cultivated. A small acreage is irrigated by sprinklers. The main crops are corn, grain sorghum, alfalfa, and forage sorghum. Cattle winter on the forage crops. Many areas that formerly were cultivated have been reseeded to native grass.

Maintaining or increasing the productivity of the rangeland is the main concern of management. Drought is a hazard. Water erosion also is a hazard, especially in overgrazed areas. A planned grazing system that includes proper grazing use is needed. The supply of water for livestock is good. In the areas managed for dryland crops, an insufficient amount of rainfall is a limitation and soil blowing and water erosion are hazards unless a plant cover protects the surface.

Ranches or farms on this association average about 1,000 acres. A few good gravel roads are maintained along section lines or on the smooth divides between canyons, but roads are not along many section lines. Access to wells and pastures generally is provided by trails maintained by the farmers or ranchers. Most of the beef calves are marketed at auctions in adjacent counties. Forage crops are fed to cattle locally, and grain crops are fed to livestock or sold to elevators in the county or in adjacent counties.

4. Coly-Uly-Hobbs association

Deep, very gently sloping to very steep, well drained to excessively drained, silty soils formed in loess and alluvium on uplands and flood plains

This association consists of soils on alternating narrow divides and canyons (fig. 6). The soils are very gently sloping on the bottoms of the canyons and moderately sloping to very steep on the sides. The canyon bottoms are intermittent drainageways. A few are cut by meandering, entrenched channels. Catsteps or abrupt

vertical escarpments are common in the very steep areas.

This association occupies about 47,000 acres, or about 16 percent of the county. It is about 62 percent Coly soils, 20 percent Uly soils, 15 percent Hobbs soils, and 3 percent minor soils (fig. 7).

The Coly soils are moderately steep to very steep and are on divides and the sides of the canyons. They are somewhat excessively drained and excessively drained. Typically, the surface soil is grayish brown, very friable silt loam about 5 inches thick. Below this is a transition layer of brown silt loam about 2 inches thick. The underlying material to a depth of 60 inches is pale brown silt loam. The soils generally are calcareous throughout.

The Uly soils are strongly sloping and moderately steep and are on smooth divides and on the long, smooth sides of the canyons. They are well drained. Typically, the surface soil is grayish brown, very friable silt loam about 7 inches thick. The subsoil is dark grayish brown and grayish brown silt loam about 8 inches thick. The underlying material to a depth of 60 inches is light gray silt loam.

The Hobbs soils are on flood plains and are occasionally flooded. They are very gently sloping or gently sloping. Typically, the surface soil is dark grayish brown, very friable silt loam about 8 inches thick. The underlying material to a depth of 60 inches is grayish brown, light brownish gray, dark grayish brown, light gray, and brown silt loam.

Minor in this association are Hall, Holdrege, and Hord soils. The very gently sloping and gently sloping Hall and Holdrege soils are on the smoother parts of high ridges. Hord soils are on small benches adjacent to drainageways.

Most of this association supports native grass and is used for grazing. Raising beef cattle is the main livestock enterprise. Cow-calf enterprises are dominant. Some of the very gently sloping to strongly sloping areas on ridgetops, side slopes, and canyon bottoms are used for dryland crops. Wheat and grain sorghum are the main crops. Some of the strongly sloping areas on canyon rims and bottoms are used for annual forage crops, which provide winter feed to livestock. Maintaining or increasing the productivity of the rangeland is the main concern of management. Drought is a hazard.

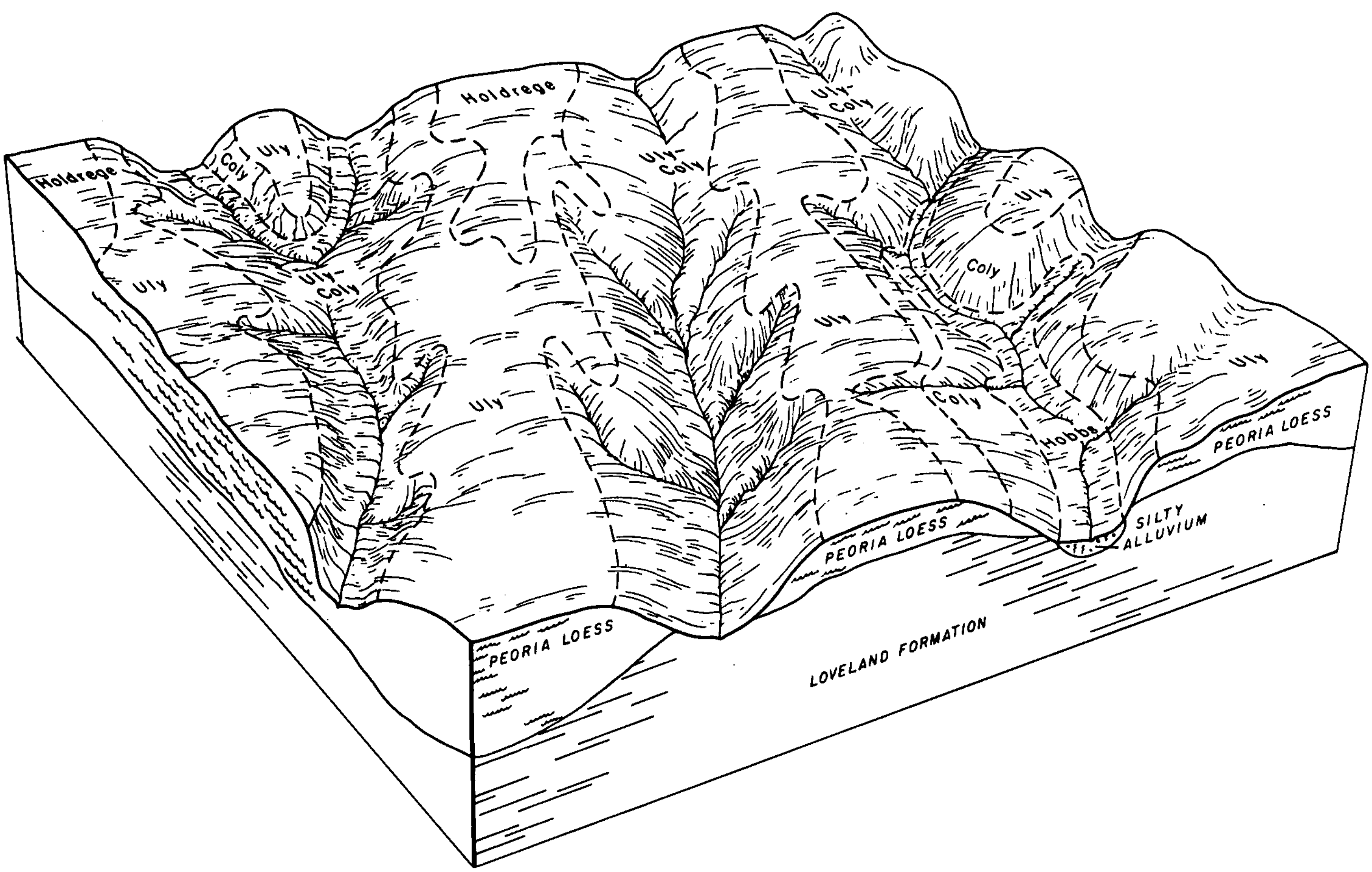

Figure 5.—Typical pattern of soils and parent material in the Uly-Coly association.

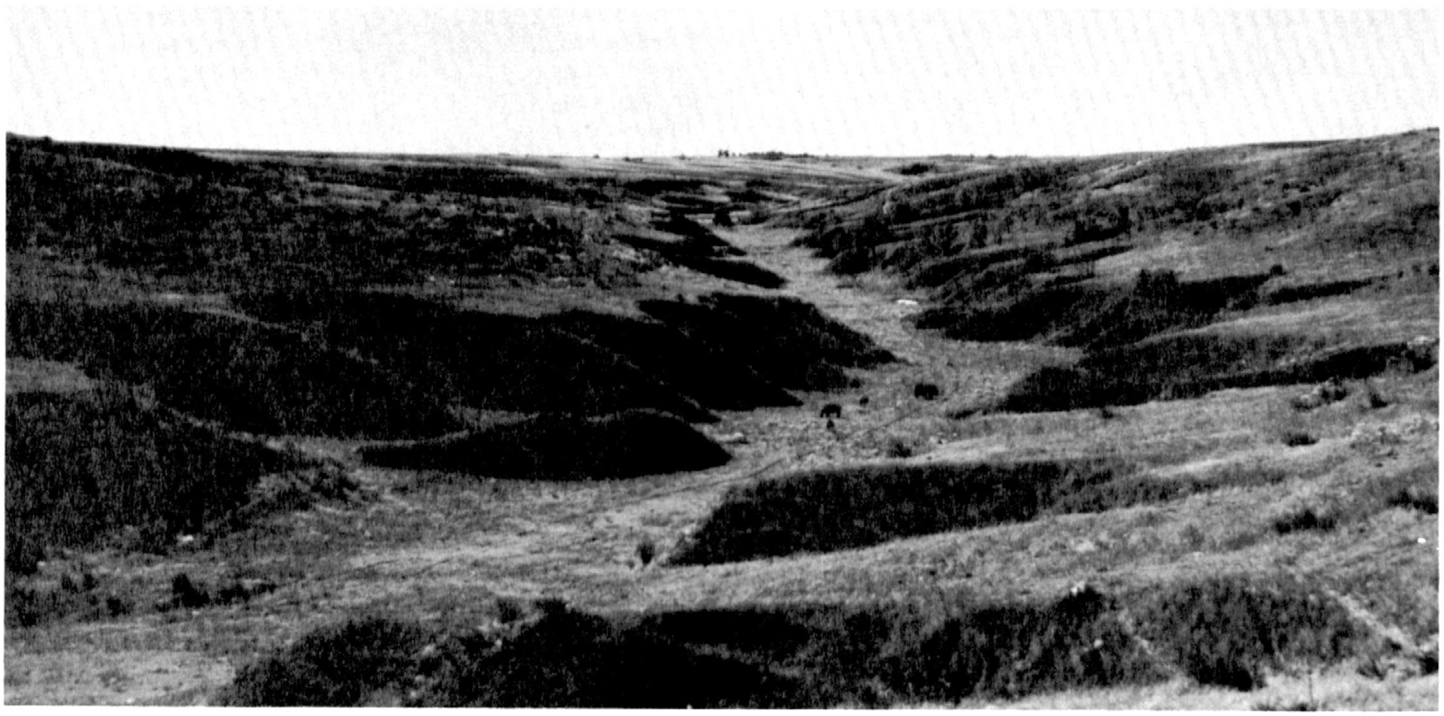

Figure 6.—An area of the Coly-Uly-Hobbs association. Coly soils are strongly sloping to very steep, Uly soils are moderately steep, and Hobbs soils are on the bottom of drainageways.

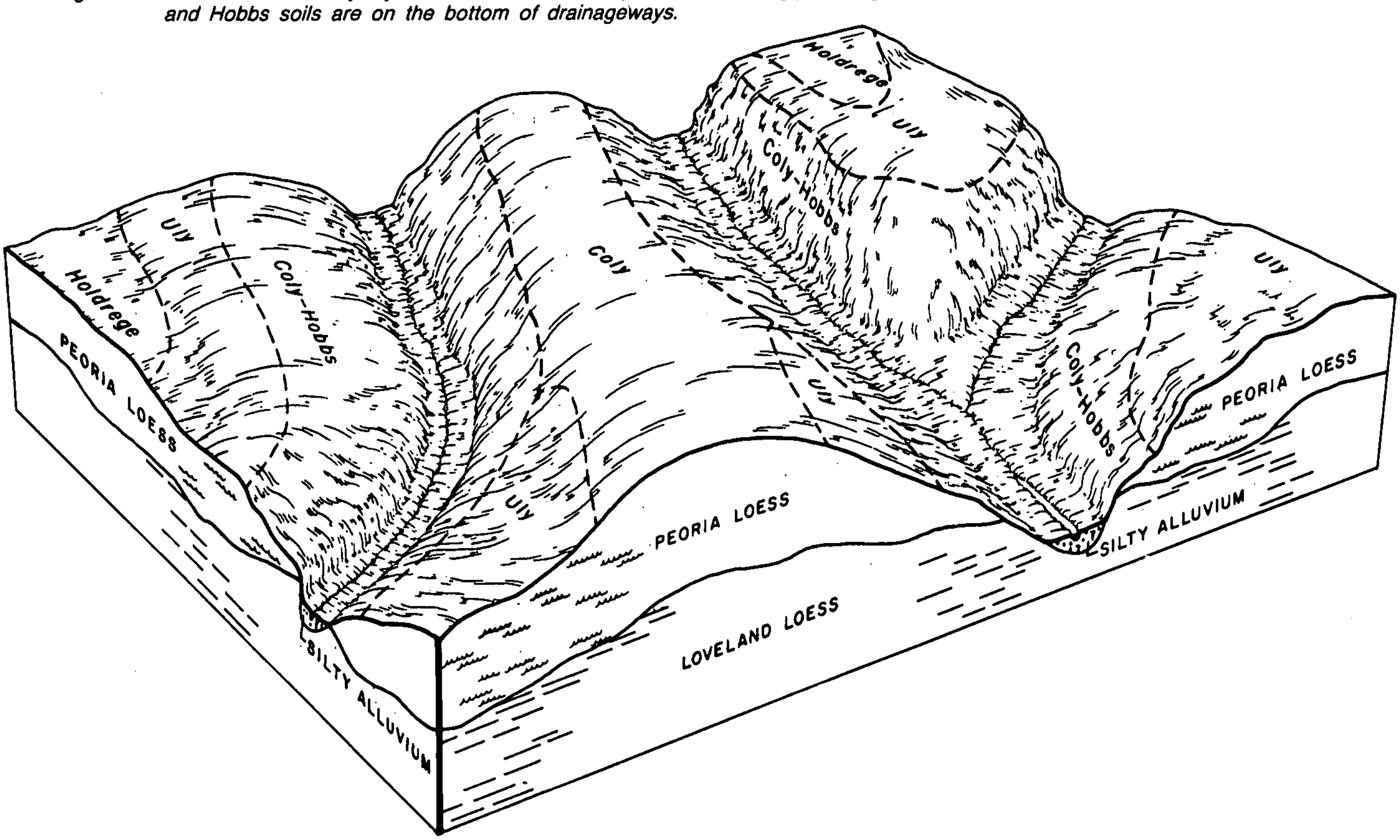

Figure 7.—Typical pattern of soils and parent material in the Coly-Uly-Hobbs association.

Water erosion is the main hazard on this association. A planned grazing system that includes proper grazing use increases the production of desirable grasses and helps to keep channels and gullies from forming. A protective plant cover and structures that reduce the runoff rate are needed in cultivated areas. Adequate wells for livestock water generally are available.

Ranches on this association average about 1,200 acres. Some gravel and improved dirt roads are along section lines, but most follow narrow divides or canyon bottoms. Access to many areas is provided by unimproved roads or canyon trails. Most of the cattle are sold at auctions in other counties. Some ranches are headquartered in adjacent counties. The parts of these ranches that are in this county are used only for summer grazing.

5. Hobbs-Cozad-Hord association

Deep, nearly level to gently sloping, well drained, silty soils formed in alluvium and loess on flood plains, stream terraces, and foot slopes

This association is on flood plains, stream terraces, and foot slopes and fans adjacent to drainageways. The flood plains are dissected by a few deep, meandering channels. Except for the upper 7 miles of Plum Creek, these channels are constantly flowing streams fed by springs.

This association occupies about 12,000 acres, or about 4 percent of the county. It is about 54 percent Hobbs soils, 21 percent Cozad soils, 19 percent Hord soils, and 6 percent minor soils (fig. 8).

The nearly level and very gently sloping Hobbs soils are on flood plains and in intermittent drainageways crossing the stream terraces. They are occasionally or frequently flooded for brief periods. Typically, the surface soil is grayish brown, friable silt loam about 6 inches thick. The underlying material to a depth of 60 inches is very stratified, dark grayish brown and grayish brown silt loam.

The nearly level to gently sloping Cozad soils are on terraces adjacent to the foot slopes or side slopes in the uplands. Typically, the surface soil is dark grayish brown

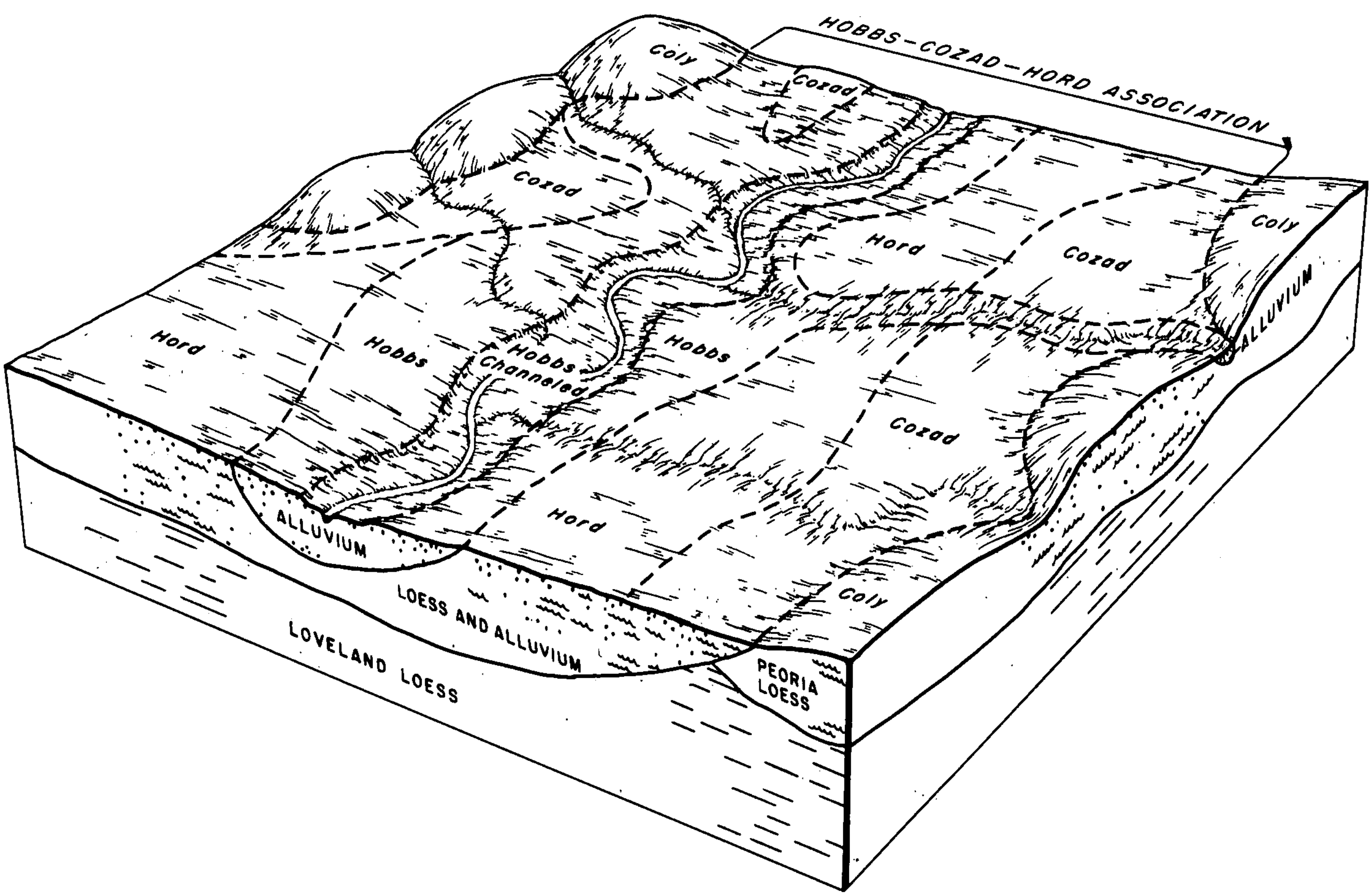

Figure 8.—Typical pattern of soils and parent material in the Hobbs-Cozad-Hord association.

silt loam about 9 inches thick. The subsoil is light brownish gray silt loam about 8 inches thick. The underlying material to a depth of 60 inches is light brownish gray silt loam.

The nearly level and very gently sloping Hord soils are on stream terraces. They are slightly higher in elevation than the Hobbs soils and slightly lower in elevation than the Cozad soils. Typically, the surface soil is dark grayish brown silt loam about 12 inches thick. The subsoil is dark grayish brown and grayish brown silt loam about 13 inches thick. The underlying material to a depth of 60 inches is pale brown silt loam and grayish brown silty clay loam.

Minor in the association are Coly, Holdrege, and Uly soils. The strongly sloping and moderately steep Coly and Uly soils are on side slopes in the uplands. Holdrege soils are at the base of the side slopes.

Farms on this association are diversified, mainly a combination of cash grain and livestock enterprises. Many of the farms extend into adjacent associations in the loess-covered uplands. Much of the acreage on stream terraces and foot slopes is cultivated, and part of it is irrigated with water from wells or from perennial streams. Corn is the main dryland and irrigated crop. Small acreages are used for irrigated alfalfa and tame grasses. Other dryland crops are wheat, grain sorghum, and forage crops. The forage crops are used as winter feed.

Most areas of the Hobbs soils along entrenched channels and on the adjacent small terraces support native grass that generally is grazed by beef cattle. They are good habitat for upland and rangeland wildlife, including pheasant, quail, and deer. Brush and trees are common in most areas along the channels.

The flooding on the Hobbs soils is the main hazard affecting land uses. Channel erosion is a hazard in the drainageways. Dams on the drainageways and diversions, terraces, grassed waterways, contour farming, and stubble mulch tillage on the uplands help to control the flooding. They also help to control water erosion.

Farms on this association average about 1,200 acres. Most extend into adjoining associations. Most farmsteads are near improved gravel roads. Where they cross the channels, roads are along the section lines, but otherwise they follow the smoother divides or terraces. Much of the grain and livestock produced on this association is marketed in adjacent counties.

6. Cozad-Hord association

Deep, nearly level to gently sloping, well drained, silty soils formed in alluvium and loess on stream terraces and foot slopes

This association occurs as broad areas of nearly level to gently sloping soils on terraces and foot slopes in the valley of the Platte River. It occupies about 3,100 acres, or about 1 percent of the county. It is about 44 percent Cozad soils, 43 percent Hord soils, and 13 percent minor soils.

The Cozad soils commonly are in the slightly higher areas on the broad stream terraces and on foot slopes adjoining the breaks to loess-covered uplands. They are nearly level to gently sloping. Typically, the surface soil is dark grayish brown silt loam about 13 inches thick. The subsoil is grayish brown silt loam about 6 inches thick. The underlying material to a depth of 60 inches is pale brown silt loam and very fine sandy loam.

The Hord soils are in smooth areas on stream terraces. They are slightly lower in elevation than the Cozad soils. They are nearly level and very gently sloping. Typically, the surface soil is dark grayish brown, friable silt loam about 14 inches thick. The subsoil is dark grayish brown and grayish brown silt loam about 16 inches thick. The underlying material to a depth of 60 inches is pale brown silt loam over grayish brown silty clay loam.

Minor in this association are Anselmo, Hall, Hobbs, and Scott soils. The loamy Anselmo soils occur as very gently sloping areas on the slightly higher ridges on the terraces and as areas on foot slopes. The nearly level Hall soils are in the slightly lower areas. Hobbs soils are along channeled drainageways. Scott soils are in depressions in the terraces and are very poorly drained.

Most of the farms on this association are used for cash grain crops. Almost all areas are irrigated. Corn, grain sorghum, and alfalfa are the main crops. Sugar beets are grown in some areas. A plentiful supply of water is available from wells and canals. Some cattle and hogs are fattened and marketed.

The hazard of water erosion is slight in the nearly level and very gently sloping areas and moderate in the gently sloping areas on foot slopes that receive runoff from upland drainageways. Soil blowing is a hazard in areas where the surface is bare. Timely application and proper distribution of irrigation water are needed. A drainage system is needed in the nearly level or slightly depressional areas, but installing such a system is difficult because outlets generally are not available. Maintaining fertility is a concern of management.

Farms on this association average about 480 acres. The major soils are intensively farmed, more intensively than most of the other soils in the county. Improved gravel roads are along most section lines and are close to paved roads. Grain and livestock generally are marketed in adjacent counties.

7. Anselmo association

Deep, very gently sloping to strongly sloping, well drained, loamy soils formed in eolian deposits on uplands

This association consists mainly of soils that formed in mixed silty and loamy wind-deposited material on uplands. The landscape is characterized by high, flat ridgetops, swales, low flats, long, narrow ridges oriented

northwest to southeast, and some small undulating areas. The drainage pattern is poorly defined.

This association occupies about 1,970 acres, or about 0.6 percent of the county. It is about 75 percent Anselmo soils and 25 percent minor soils.

Typically, the surface soil of the Anselmo soils is dark grayish brown, very friable fine sandy loam about 15 inches thick. The subsoil is grayish brown fine sandy loam about 11 inches thick. The underlying material to a depth of 60 inches is pale brown. It is fine sandy loam in the upper part and very fine sandy loam in the lower part.

Minor in this association are Coly and Holdrege soils on side slopes, Hobbs soils in swales, and the very poorly drained Scott soils in depressions.

Farms on this association are diversified, generally a combination of cash grain and livestock enterprises. Wheat and grain sorghum are the main dryland crops. Corn and alfalfa are the main irrigated crops. The more hummocky and rolling areas generally are used as rangeland. Soil blowing is the main hazard on this association. A protective cover of plants or crop residue is needed. Measures that maintain the level of fertility and an efficient system of water application are the main management needs in irrigated areas. Proper grazing use is needed in the areas used as rangeland.

The Johnson Lake State Recreation Area is on this association. Many permanent residences are around the lake. A golf course and facilities for camping and most water-related recreational activities are available in this area. Measures that precisely control fertility levels are needed if landscape plantings, trees, or grasses are grown. Applications of water are needed, but controlling the water is difficult because the Anselmo soils are moderately rapidly permeable.

Farms on this association average about 320 acres. Most include more acres in adjoining associations than in this association. Gravel roads are along most section lines, and a paved highway extends through the association. Much of the grain grown on this association is sold within the county. Cattle and hogs are marketed at auctions or directly to packers in other counties.

8. Gosper-Lex association

Nearly level, moderately well drained and somewhat poorly drained, loamy soils that are deep or are moderately deep over sand and gravel; formed in alluvium on low terraces and bottom land

This association consists of nearly level soils on bottom land in the valley of the Platte River. It occupies about 1,280 acres, or about 0.4 percent of the county. It is about 40 percent Gosper soils, 38 percent Lex soils, and 22 percent minor soils. On about 13 percent of the association, the soils are affected by excess salinity or alkalinity.

The Gosper soils are on low terraces and are moderately well drained. They are deep. Typically, the surface soil is dark gray, very friable loam about 12 inches thick. The subsoil is about 12 inches thick. It is very dark grayish brown loam in the upper part and grayish brown sandy clay loam in the lower part. The upper part of the underlying material, to a depth of about 52 inches, is pale brown and brown fine sandy loam. The lower part to a depth of 60 inches is pale brown loamy sand.

The Lex soils are at the slightly lower elevations on bottom land and are somewhat poorly drained. They are moderately deep over gravelly sand. Typically, the surface soil is about 24 inches thick. It is dark gray loam and gray silt loam in the upper part, dark gray silty clay loam in the next part, and dark grayish brown loam in the lower part. The underlying material extends to a depth of 60 inches or more. It is pale brown loam in the upper part, light gray fine sand in the next part, and very pale brown and light gray gravelly sand in the lower part.

Minor in this association are Gothenburg and Platte soils. Gothenburg soils are very shallow over sand and gravel, and Platte soils are shallow over sand and gravel. Both soils generally are at the lowest elevations on the landscape, near the river.

Farms on this association are diversified. Many are cow-calf enterprises. Some hogs are raised and fattened. Most areas of the Gothenburg and Platte soils support native grass and are used for grazing. The soils in the higher areas are cultivated. The main crops are corn and alfalfa. Most of the areas used for corn are irrigated. Some of the areas used for alfalfa are subirrigated in spring and early in summer, but irrigation is needed when the water table drops into the underlying sand and gravel. Shallow wells provide an abundant supply of irrigation water. Gravity irrigation is the dominant irrigation system. Pivot systems have been installed in areas where introduced grasses are grown for hay and pasture.

Wetness in the spring interferes with tillage and planting. Crop growth is retarded in the areas of saline-alkali soils. A surface drainage system is needed in these areas. Applications of the proper kinds and amounts of fertilizer and an irrigation system that properly applies and distributes water are important management needs. A planned grazing system that includes proper grazing use is needed in the areas used as rangeland.

Farms on this association average about 480 acres. Most are part of farms that extend into adjoining associations. Gravel roads are along most section lines, and some roads are paved. Access to markets is good. Corn is either sold to elevators in Lexington or fed locally. Most of the alfalfa is fed to livestock, but some is sold to dehydrators. Fattened cattle and hogs are sold at auctions or directly to packers in adjacent counties.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and identifies the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Holdrege silt loam, 0 to 1 percent slopes, is one of several phases in the Holdrege series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils that occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Uly-Coly silt loams, 9 to 30 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimiliar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

Some soil boundaries and soil names in this survey do not match those in the soil surveys of adjacent counties. Differences are the result of changes in mapping guidelines, slope groupings, correlation procedures, or concepts of soil classification.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

AnB—Anselmo fine sandy loam, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, well drained soil is on high ridgetops, in swales, and on foot slopes on uplands and stream terraces. Areas are irregular in shape and range from 5 to 160 acres in size.

Typically, the surface soil is dark grayish brown, very friable fine sandy loam about 15 inches thick. The subsoil is grayish brown, very friable fine sandy loam about 11 inches thick. The upper part of the underlying material, to a depth of about 50 inches, is pale brown fine sandy loam. The lower part to a depth of 60 inches is pale brown very fine sandy loam. In some areas silty material is at a depth of 2 to 5 feet. This material commonly is calcareous.

Included with this soil in mapping are small areas of Holdrege and other medium textured soils. These soils commonly are on foot slopes and in swales. Their surface soil is siltier than that of the Anselmo soil. Also, Holdrege soils have a fine textured subsoil. Included soils make up less than 10 percent of the unit.

Permeability is moderately rapid in the Anselmo soil, and available water capacity is moderate. Runoff is slow to medium. Organic matter content is moderately low. The soil is easy to till. It releases moisture readily to plants.

Most areas of this soil are cultivated. A few of the cultivated areas are irrigated. A few areas support native grass.

If used for dryland farming, this soil is suited to wheat, sorghum, and corn. It is moderately susceptible to soil blowing and slightly susceptible to water erosion. It is droughty in years when the amount of rainfall is below average. A protective cover of crop residue or plants is needed at all times. A conservation tillage system that leaves crop residue or vegetation on the surface, stubble

mulching, and cover crops help to control soil blowing and water erosion.

If irrigated, this soil is suited to corn, grain sorghum, tame grasses, and alfalfa. Sprinkler irrigation generally is the most practical irrigation system. Frequent applications of a limited amount of water are needed. A conservation tillage system that leaves crop residue or vegetation on the surface is needed.

This soil is suited to introduced and native grasses. A cover of these grasses is effective in controlling soil blowing and water erosion. Overgrazing or untimely haying, however, thins out the plant cover and causes deterioration of the native plant community. A planned grazing system that includes proper grazing use helps to keep the range in good condition.

This soil is suited to the trees and shrubs commonly grown as windbreaks. A plant cover or strips of sod between the tree rows help to control soil blowing. Undesirable weeds and grasses compete with the trees or shrubs for available moisture. They can be controlled by timely cultivation and by applications of carefully selected herbicides.

This soil is suitable as a site for buildings, local roads, and septic tank absorption fields. Installing the absorption fields at a sufficient distance from facilities that supply water for domestic uses helps to prevent contamination. Seepage is a problem on sites for sewage lagoons unless the bottom of the lagoon is sealed. Frost action is a hazard on sites for local roads. Crowning the roadbed by grading and constructing adequate side ditches improve surface drainage and thus help to prevent the road damage caused by frost action.

The capability units are IIe-3 dryland and IIe-8 irrigated; Sandy range site; windbreak suitability group 5.

AnC—Anselmo fine sandy loam, 3 to 6 percent slopes. This deep, gently sloping, well drained soil occurs as irregularly shaped areas on uplands and foot slopes above stream terraces. The areas range from 10 to 70 acres in size.

Typically, the surface soil is grayish brown, very friable fine sandy loam about 15 inches thick. The subsoil is grayish brown, very friable fine sandy loam about 7 inches thick. The underlying material to a depth of 60 inches is fine sandy loam. In a few areas the dark surface soil is less than 15 inches thick. In a few places silty material is at a depth of 2 to 5 feet.

Included with this soil in mapping are hummocky areas where the surface layer is thinner than that of the Anselmo soil and the underlying material is somewhat coarser textured. Included areas make up about 10 to 15 percent of the unit.

Permeability is moderately rapid in the Anselmo soil, and available water capacity is moderate. Runoff is medium. Organic matter content is moderately low. The soil absorbs moisture easily and releases it readily to plants.

Most areas of this soil are cultivated. A few of the cultivated areas are irrigated. A few small areas support native grasses.

If used for dryland farming, this soil is suited to wheat, grain sorghum, corn, and forage crops and to grasses and alfalfa for pasture. It is modertely susceptible to soil blowing and water erosion. It is droughty in years when the amount of rainfall is below average. A conservation tillage system that keeps vegetation or crop residue on the surface is needed. Returning crop residue to the soil increases the organic matter content and helps to control water erosion. Windbreaks help to control soil blowing. Terraces can be used to control water erosion on the uniform slopes, but designing terraces for the undulating slopes is difficult.

If irrigated, this soil is suited to corn, grain sorghum, alfalfa, and introduced grasses. The main hazards are soil blowing and water erosion. A conservation tillage system that leaves vegetation or crop residue on the surface is needed. Crops respond well to irrigation. Sprinkler irrigation generally is the most practical system. Because of a moderately high intake rate, the moderately rapid permeability, and the moderate available water capacity, careful management of the irrigation water is needed. If the amount of water applied exceeds the amount that the soil can hold, water is wasted and plant nutrients are leached below the root zone.

This soil is suited to introduced and native grasses. A cover of these grasses is very effective in controlling soil blowing and water erosion. Overgrazing and untimely haying, however, thin out the protective plant cover and cause deterioration of the native plant community, severe soil blowing, and the formation of blowouts. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to keep the range in good condition.

This soil is suited to most of the trees and shrubs commonly grown as windbreaks. The windbreaks help to control soil blowing. Undesirable grasses and weeds compete with the trees or shrubs for available moisture. They can be controlled by cultivation and by applications of carefully selected herbicides.

This soil is suitable as a site for buildings, local roads, and septic tank absorption fields. Because of rapidly permeable strata in the coarser textured underlying material in some included areas, however, the effluent from septic tank absorption fields can pollute ground water. These included areas should not be used as sites for sanitary facilities. Seepage is a problem if the soil is used as a site for sewage lagoons unless the bottom of the lagoon is sealed. Frost action is a hazard on sites for local roads. Crowning the roadbed by grading and constructing adequate side ditches improve surface drainage and thus help to prevent the damage caused by frost action.

The capability units are IIIe-3 dryland and IIIe-8 irrigated; Sandy range site; windbreak suitability group 5.

AnD—Anselmo fine sandy loam, 6 to 11 percent slopes. This deep, strongly sloping, well drained soil generally is on the lower side slopes on the breaks below the silty uplands and above the high stream terraces. In a few small areas it is on ridges and side slopes in the uplands. Areas are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface soil is dark grayish brown, very friable fine sandy loam about 12 inches thick. The subsoil is grayish brown fine sandy loam about 8 inches thick. The underlying material to a depth of 60 inches is light brownish gray and pale brown fine sandy loam. Some areas have been cultivated and are eroded. In these areas the surface soil is light colored and coarser textured.

Included with this soil in mapping are areas, on small ridges below the breaks and above the stream terraces, where the surface soil is loamy fine sand and the underlying material is loamy sand. Also included, below the dam at Johnson Lake, is an area where 25 percent of the acreage has been altered by construction activities or erosion. In the altered areas, the surface soil is loamy sand and many silty strata are in the underlying material. Included areas make up about 15 percent of the unit.

Permeability is moderately rapid in the Anselmo soil, and available water capacity is moderate. The intake rate is high, but runoff is medium. Organic matter content is moderately low.

Most of the acreage of this soil supports native grass. A few areas are cultivated. Some areas around Johnson Lake have been developed for recreational uses.

This soil is poorly suited to cropland. Alfalfa, wheat, grain sorghum, and annual forage plants are grown in areas managed for dryland crops. Water erosion and soil blowing are the principal hazards in all areas. Terraces help to control water erosion in areas where slopes are long and smooth. They are not practical, however, in hummocky areas. Cover crops and tillage methods that keep crop residue on the surface help to control erosion and soil blowing.

This soil is poorly suited to irrigation. Because of the slope, sprinkler irrigation is the only suitable method. Closely spaced crops, legumes, and introduced grasses should be selected. Careful management of the irrigation water is needed. If the amount of water applied exceeds the amount that the soil can hold, water is wasted and plant nutrients are leached below the root zone.

This soil is suitable as rangeland. A cover of native grasses is effective in controlling soil blowing and water erosion. Overgrazing, however, reduces the extent of the protective plant cover and causes deterioration of the desired grasses, severe soil blowing, and the formation of blowouts. A planned grazing system that includes proper grazing use and timely deferment of grazing or haying help to keep the range in good condition.

This soil is suited to the trees and shrubs commonly grown as windbreaks. An insufficient amount of moisture is the main limitation and soil blowing the main hazard. A plant cover or strips of sod between the tree rows help to control soil blowing. When a site is prepared for planting, tillage should be restricted to the area where the tree row will be established. The trees should be planted on the contour if possible. Timely cultivation helps to control weeds, but it should be restricted to the area of the tree row. Applications of carefully selected herbicides also help to control the weeds. The application rate should be that recommended for a sandy soil.

The slope is a limitation if this soil is used for recreational development. In most recreational areas it can be overcome by landscaping and shaping. On sites for some playground activities, however, it cannot be overcome. On golf courses and in similar recreational areas, a carefully planned system of water application is needed. The amount of water applied and the rate of application should be determined by the moderate available water capacity, the moderately rapid permeability, and the strong slope. Applications of fertilizer, mostly nitrogen, are needed.

This soil is suitable as a septic tank absorption field, but the slope is a limitation. Lateral seepage and downslope flow are problems. Grading the site and installing the distribution lines on the contour help to overcome the slope. Installing the absorption field at a sufficient distance from facilities that supply water for domestic uses and from the ponds and watercourses at the lower elevations helps to prevent contamination. The included soils that have rapidly permeable, coarse textured strata should not be used as absorption fields. This soil is poorly suited to sewage lagoons and to any water-storage structures because of seepage and slope. Lining or sealing the lagoon helps to prevent seepage. Extensive grading is needed to modify the slope and shape the lagoon.

The slope is a limitaion if this soil is used as a site for buildings or local roads. Also, frost action is a hazard on sites for local roads. A building design that accommodates the slope is needed. Otherwise, building sites should be graded. Cutting and filling generally are needed on sites for local roads. Crowning the roadbed by grading and constructing adequate side ditches improve surface drainage and thus help to prevent the road damage caused by frost action.

The capability units are IVe-3 dryland and IVe-8 irrigated; Sandy range site; windbreak suitability group 5.

CoD2—Coly silt loam, 6 to 9 percent slopes, eroded. This deep, strongly sloping, well drained and somewhat excessively drained soil is on loess-covered uplands. Slopes are short below nearly level divides and above steeply sloping upland drainageways. Small rills are common after rains. Tillage smooths most of them out. Most of the original surface soil has been removed. Areas are irregular in shape and range from 5 to 150 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 5 inches thick. The underlying material to a depth of 60 inches is silt loam. It is light brownish gray in the upper part and light gray in the lower part. The soil has threads and soft, round accumulations of lime.

Included with this soil in mapping are small areas of Holdrege and Uly soils. These soils are in the slightly lower swales. Their surface soil is thicker and darker than that of the Coly soil, and their subsoil is more strongly expressed. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Coly soil, and available water capacity is high. Runoff is rapid. Organic matter content is low. The soil disperses easily in water and erodes rapidly.

Almost all of the acreage of this soil has been cultivated at one time, and more than 50 percent is still cropland. Some of the cultivated areas are irrigated. Some areas have been reseeded to native grass.

This soil is poorly suited to cultivated crops. Water erosion is the main hazard. Controlling water erosion, reducing the runoff rate, conserving moisture, and increasing the organic matter content are the main concerns of management. Erosion can be controlled by terraces, grassed waterways, and tillage practices that leave most of the crop residue on the surface.

This soil is poorly suited to irrigation. Because of the slope, sprinkler irrigation is the only suitable method. Closely spaced crops, legumes, and introduced grasses should be selected. Careful management of the irrigation water is needed.

A cover of introduced or native grasses is very effective in controlling water erosion. The soil is suited to these grasses. Overgrazing or untimely haying, however, causes deterioration of the plant community and severe water erosion. A planned grazing system that includes proper grazing use and timely deferment of grazing or haying help to keep the range in good condition.

This soil is suited to some of the trees and shrubs commonly grown as windbreaks. The only suitable species are those that are very tolerant of dry conditions and can grow in a highly calcareous soil. An insufficient amount of moisture and competition from grasses and weeds are the main concerns of management. Water erosion also is a concern. Planting the trees in rows that follow the contour and controlling weeds with a minimum of tillage help to control erosion. Because of the low organic matter content, care is needed if herbicides are applied. The type and amount should be carefully selected.

Septic tank absorption fields function satisfactorily in this soil. The slope is a limitation on sites for sewage lagoons. Grading is needed to modify the slope and shape the lagoon. The soil is suitable as a building site. Low strength is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability units are IVe-9 dryland and IVe-6 irrigated; Limy Upland range site; windbreak suitability group 8.

CoE2—Coly silt loam, 9 to 20 percent slopes, eroded. This deep, moderately steep, somewhat excessively drained soil is along intermittent drainageways and on ridgetops in the loess-covered uplands. Slopes are 100 to 900 feet long. Accelerated water erosion has removed most of the original dark surface layer. Areas are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is brown, very friable silt loam about 3 inches thick. The underlying material to a depth of 60 inches is very friable silt loam. It is pale brown in the upper part and very pale brown in the lower part. The soil has threads and soft, round accumulations of lime.

Included with this soil in mapping are small areas of the less sloping, arable Coly soils. These soils were reseeded to grasses 10 to 15 years ago. As a result, their surface soil commonly is slightly darker. Also included are small areas of Hobbs soils along drainageways and Holdrege and Uly soils on foot slopes. The Hobbs soils are dark and are stratified. The Holdrege and Uly soils have a dark surface layer that is more than 3 inches thick. Included soils make up about 15 percent of the unit.

Permeability is moderate in this Coly soil, and available water capacity is high. The soil releases moisture readily to plants. Runoff is rapid. Organic matter content is low.

Almost all of the acreage of this soil was cultivated at one time. Part has been reseeded to native grass.

This soil is unsuited to cultivated crops because it is moderately steep and is subject to severe water erosion. The erosion results in downstream sedimentation.

This soil is best suited to native grasses. A cover of these grasses is effective in controlling erosion. Overgrazing or grazing before the grasses are established reduces the extent of the protective plant cover and causes deterioration of desired range grasses. A planned grazing system that includes proper grazing use and deferred grazing helps to keep the range in good condition.

This soil generally is unsuited to the trees and shrubs grown as windbreaks. Planting and cultivating are difficult because of the moderately steep slope. The high content of lime and the dry conditions reduce survival and growth rates. Few species can grow well under these conditions. Selected species can be grown to enhance wildlife habitat or selected recreational areas if the trees or shrubs are hand planted and special methods are used to control erosion. These methods include growing grass between the tree rows, planting across the slope, and minimizing tillage.

Septic tank absorption fields function well in this soil, but the slope is a limitation. Grading the site and installing the distribution lines on the contour help to

overcome this limitation. The slope is a more serious limitation on sites for sewage lagoons. A suitable alternative site should be selected.

The slope is a limitation if this soil is used as a building site. A building design that accommodates the slope is needed. Otherwise, building sites should be graded. Low strength is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability unit is VIe-9 dryland; Limy Upland range site; windbreak suitability group 10.

CpG—Coly-Hobbs silt loams, 2 to 60 percent slopes. These deep, nearly level to very steep, excessively drained and well drained soils are on deeply dissected uplands that have narrow bottoms (fig. 9). They commonly are at the upper end of the drainageways but in some areas are in a canyon several miles long. Areas are very irregular in shape and range from 15 to 3,000 acres in size. They are about 70 percent Coly soil and 15 percent Hobbs soil. The Hobbs soil occurs as areas so small or so narrow that mapping it separately is not practical.

The Coly soil is on side slopes and ridges and has a slope of 20 to 60 percent. A succession of short, vertical, sparsely vegetated exposures called "catsteps" is common on the side slopes. The Hobbs soil is on canyon bottoms and has a slope of 2 to 6 percent. It is frequently flooded by runoff from surrounding slopes. The canyon bottoms are 30 to 200 feet wide. Many are smooth, but some have eroded channels that are 2 to 10 feet deep.

Typically, the Coly soil has a surface layer of grayish brown, friable silt loam about 4 inches thick. The underlying material to a depth of 60 inches is light brownish gray silt loam. The soil has threads and soft, round accumulations of lime and is calcareous throughout.

Typically, the Hobbs soil has a surface layer of grayish brown, friable, finely stratified silt loam about 7 inches

Figure 9.—An area of Coly-Hobbs silt loams, 2 to 60 percent slopes. The Coly soil is steep or very steep. The Hobbs soil is on the bottom of drainageways.

thick. The underlying material to a depth of 60 inches is calcareous silt loam. The upper part, to a depth of about 20 inches, is grayish brown and is finely stratified with light brownish gray material. The lower part is pale brown. Threads and accumulations of lime are in old root channels to a depth of about 37 inches.

Included with these soils in mapping are small areas of the moderately steep Uly soils on ridges. Also included, at the base of some steep canyon sides, are small areas where reddish brown or grayish brown silty loess is exposed and areas on the steep canyon sides where discontinuous sandy strata are exposed. Included areas make up about 10 percent of the unit.

Runoff is rapid on the Coly soil. It is slow or medium on the Hobbs soil, depending on the slope of the canyon bottom. Organic matter content is moderately low in the Coly soil and moderate in the Hobbs soil. Both soils are moderately permeable, have a high available water capacity, and release water readily to plants.

Almost all areas of these soils support native grass and are used for grazing. A few small areas of the Hobbs soil on the canyon bottoms have been cultivated. Both soils, however, generally are unsuited to cultivated crops. The Hobbs soil occurs as areas too small, too irregular in shape, or too inaccessible for cultivation, and the Coly soil is too steep.

These soils are suitable as rangeland. Water erosion is the chief hazard in the areas used as rangeland. Overgrazing or untimely haying reduces the extent of the protective plant cover and causes deterioration of the native plant community. If the runoff rate is excessive, gullies form on the steep side slopes and either deep channels are cut into or an excessive amount of silt is deposited on the canyon bottoms. Obtaining an even distribution of grazing is difficult because of the very steep side slopes. Salt and watering facilities should be well distributed. A planned grazing system that includes proper grazing use and timely deferment of grazing or haying helps to keep the range in good condition.

In most areas these soils are unsuited to the trees and shrubs commonly grown as windbreaks. The trees and shrubs that can grow in a limy soil can be established on wildlife habitat or in selected recreational areas if they are hand planted and if special measures are applied to overcome the slope and the frequent flooding.

These soils generally are unsuitable as sites for sanitary facilities or buildings because of the slope and the flooding. A suitable alternative site should be selected.

The low strength of both soils, the slope of the Coly soil, and the flooding on the Hobbs soil are limitations on sites for local roads. Providing coarse grained subgrade or base material helps to overcome the low strength. A surface pavement that is thick enough to compensate for the low strength also is helpful. Cutting and filling are needed in many areas to modify the slope. Building the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by floodwater. Because of the hazard of erosion, a plant cover should be established as soon after construction as possible.

The capability unit is VIIe-9 dryland; the Coly soil is assigned to Thin Loess range site and the Hobbs soil to Silty Overflow range site; both soils are assigned to windbreak suitability group 10.

Cs—Cozad silt loam, 0 to 1 percent slopes. This deep, level and nearly level, well drained soil is on terraces along the major streams and creeks in the valley of the Platte River and on benches adjacent to deeply entrenched channels along the larger creeks. It is subject to rare flooding. Areas are irregular in shape and range from 5 to 1,000 acres in size.

Typically, the surface soil is dark grayish brown silt loam about 13 inches thick. The subsoil is grayish brown silt loam about 6 inches thick. The underlying material to a depth of 60 inches is pale brown silt loam and very fine sandy loam. In places the dark surface layer is less than 7 inches thick because the topsoil has been removed by land leveling. In a few areas the dark surface soil is more than 20 inches thick, and in a few it is fine sandy loam.

Included with this soil in mapping are small areas of the loamy Anselmo soils and some small, salt-affected areas in slight depressions. Included areas make up 5 to 10 percent of the unit.

Permeability is moderate in the Cozad soil, and available water capacity is high. Runoff is slow. Organic matter content is moderate. The soil generally is easy to till. It absorbs water easily and releases moisture readily to plants.

Most areas of this soil are used for cultivated crops that are irrigated. The rest, mostly along the major creeks, are used for dryland crops.

If used for dryland farming, this soil is suited to wheat, grain sorghum, corn, and alfalfa and to grasses and legumes for pasture. Crop yields are limited, however, because of an insufficient amount of moisture during periods when the amount of rainfall is below average. Returning crop residue to the soil conserves moisture, increases the organic matter content, and improves fertility and tilth. Soil blowing is a hazard unless the surface is adequately protected by crops or crop residue.

If irrigated, this soil is suited to corn, alfalfa, soybeans, and sugar beets. Water can be applied by gravity or sprinkler systems. Efficient management of the irrigation water is needed. If an excessive amount is applied, water is wasted and plant nutrients are leached below the root zone. A cover of crops or crop residue helps to prevent excessive soil losses. Applications of barnyard manure and a cover of crop residue increase the infiltration rate and the water holding capacity in leveled areas.

This soil is suited to introduced or native grasses. A cover of these grasses is effective in controlling soil blowing. Overgrazing and untimely haying, however,

reduce the extent of the protective plant cover and cause deterioration of the native plant community. Proper grazing use and timely deferment of grazing or haying help to keep the grasses in good condition.

This soil is well suited to the trees and shrubs commonly grown as windbreaks. An insufficient amount of moisture during periods when the amount of rainfall is below average is the main limitation. Good site preparation, timely cultivation between the tree rows, and applications of carefully selected herbicides control weeds and increase survival and growth rates.

This soil is suitable as a site for buildings, septic tank absorption fields, and sewage lagoons, but the rare flooding is a hazard and in some areas measures that divert runoff are needed. Also, the moderate permeability is a limitation in septic tank absorption fields. It generally can be overcome by increasing the size of the absorption area. Diking helps to protect sewage lagoons from floodwater. Constructing buildings on elevated, well compacted fill material helps to prevent the damage caused by floodwater.

Flooding and frost action are hazards if this soil is used as a site for local roads. Building the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the road damage caused by floodwater. Crowning the roadbed by grading and constructing adequate side ditches improve surface drainage and thus help to prevent the damage caused by frost action.

The capability units are IIc-1 dryland and I-6 irrigated; Silty Lowland range site; windbreak suitability group 3.

CsB—Cozad silt loam, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil is both on high stream terraces, which commonly are adjacent to the foot slopes of the uplands, and along channels or drainageways. It is subject to rare flooding. Areas generally are long and narrow and range from 5 to 160 acres in size.

Typically, the surface soil is dark grayish brown silt loam about 9 inches thick. The subsoil is light brownish gray silt loam about 8 inches thick. The underlying material to a depth of 60 inches is light brownish gray silt loam. In a few areas, the surface soil is very fine sandy loam and the slope is level. In places the dark surface soil is more than 20 inches thick.

Included with this soil in mapping are small areas of Hobbs soils in drainageways. These soils make up 5 to 10 percent of the unit.

Permeability is moderate in the Cozad soil, and available water capacity is high. Runoff is medium. Organic matter content is moderate.

Most areas of this soil are cultivated. Many of the cultivated areas are irrigated. A few small areas support native grass and are used for grazing.

If used for dryland farming, this soil is suited to wheat, corn, grain sorghum, and legumes. Crop yields commonly are limited, however, by an insufficient amount of moisture. Soil blowing and water erosion are hazards. The siltation that occurs when the soil receives runoff from the steeper adjacent slopes also is a hazard. Diversions, grassed waterways, and a conservation tillage system that leaves crop residue or vegetation on the surface help to control erosion. Growing introduced grasses and legumes for hay and pasture is effective in controlling erosion. Returning crop residue to the soil and applying barnyard manure increase the organic matter content, improve fertility and tilth, and conserve moisture.

If irrigated, this soil is suited to corn and alfalfa and to introduced grasses and legumes for hay and pasture. Efficient management of the irrigation water is needed. Gravity or sprinkler systems can be used. If a sprinkler system is used, less site preparation is needed. If a gravity system is used, some land leveling commonly is needed to achieve a proper grade and an efficient distribution of the water. The supply of nitrogen and phosphorus is low in areas where light colored soil material is exposed. Applications of zinc commonly are beneficial in these areas. Diversions, grassed waterways, and a conservation tillage system that leaves crop residue or vegetation on the surface help to control erosion.

This soil is suited to introduced or native grasses. A cover of these grasses is effective in controlling soil blowing and water erosion. Overgrazing and untimely haying, however, reduce the extent of the protective plant cover and cause deterioration of the native plant community. Proper grazing use and timely deferment of grazing or haying help to keep the range in good condition.

This soil is suited to the trees and shrubs commonly grown as windbreaks. The limited amount of rainfall is the chief concern of management. Control of competing vegetation by good site preparation, by cultivation between the tree rows, and by applications of carefully selected herbicides increases survival and growth rates.

This soil is suitable as a site for buildings, septic tank absorption fields, and sewage lagoons, but the rare flooding is a hazard and in some of the higher lying areas measures that divert runoff are needed. Also, the moderate permeability is a limitation in septic tank absorption fields. It generally can be overcome by increasing the size of the absorption area. Diking helps to protect sewage lagoons from floodwater. Constructing buildings on elevated, well compacted fill material helps to prevent the damage caused by floodwater.

Flooding and frost action are hazards if this soil is used as a site for local roads. Building the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by floodwater. Crowning the roadbed by grading and constructing adequate side ditches improve surface drainage and thus help to prevent the damage caused by frost action.

The capability units are IIe-1 dryland and IIe-6 irrigated; Silty Lowland range site; windbreak suitability group 3.

CsC—Cozad silt loam, 3 to 6 percent slopes. This deep, gently sloping, well drained soil is on the short side slopes along drainageways, short slopes between terrace levels, and foot slopes on stream terraces. It is subject to rare flooding. Most areas are long and narrow and range from 5 to 50 acres in size.

Typically, the surface soil is dark grayish brown silt loam about 9 inches thick. The subsoil is grayish brown silt loam about 6 inches thick. The underlying material to a depth of 60 inches is pale brown silt loam. It is calcareous at a depth of about 21 inches. In some areas it has small, round accumulations of lime. In a few areas, the surface soil is very fine sandy loam and the slope is nearly level. In places the dark surface soil is more than 20 inches thick. In a few leveled areas lime is at or near the surface.

Included with this soil in mapping are small areas of Hobbs soils in drainageways. These soils make up 5 to 10 percent of the unit.

Most areas of this soil are cultivated. A few of the cultivated areas are irrigated. A few areas support native grass.

Permeability is moderate in the Cozad soil, and available water capacity is high. Runoff is medium. Organic matter content is moderate.

If used for dryland farming, this soil is suited to wheat and grain sorghum and to grasses and legumes for hay and pasture. Water erosion is the principal hazard. Soil blowing also is a hazard. Terraces, grassed waterways, and a conservation tillage system that keeps a protective cover on the surface increase the organic matter content and the infiltration rate, reduce the runoff rate, conserve moisture, and help to control erosion and soil blowing.

If irrigated, this soil is suited to grain sorghum, corn, and alfalfa and to tame grasses and legumes for hay and pasture. A sprinkler system is the best suited irrigation method because of the slope. Because of the hazard of water erosion, a gravity system is not suitable unless parallel benches or terraces can be constructed to achieve a proper grade in the rows. Careful management of the irrigation water is needed to prevent excessive runoff and to control erosion. Terraces, grassed waterways, and a conservation tillage system that leaves a protective cover on the surface help to control erosion.

This soil is suited to introduced or native grasses. A cover of these grasses is effective in controlling soil blowing and water erosion. Overgrazing or untimely haying, however, reduces the extent of the protective plant cover and causes deterioration of the native plant community. A planned grazing system that includes proper stocking rates and timely deferment of grazing or haying help to keep the range in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. The limited supply of moisture at planting time is the main limitation. Seedlings can survive and grow well, but good site preparation and control of competing plants through timely cultivation and applications of carefully selected herbicides are needed. Soil blowing and water erosion are hazards before the windbreak is established. Planting on the contour and growing cover crops between the tree rows help to prevent excessive soil loss.

This soil is suitable as a site for buildings, septic tank absorption fields, and sewage lagoons, but the rare flooding is a hazard and in some areas measures that divert surface water are needed. Also, the moderate permeability is a limitation in septic tank absorption fields. It generally can be overcome by increasing the size of the absorption area. Diking helps to protect sewage lagoons from floodwater. Constructing buildings on elevated, well compacted fill material helps to prevent the damage caused by floodwater.

Flooding and frost action are hazards if this soil is used as a site for local roads. Building the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the road damage caused by floodwater. Crowning the roadbed by grading and constructing adequate side ditches improve surface drainage and thus help to prevent the damage caused by frost action.

The capability units are IIIe-1 dryland and IIIe-6 irrigated; Silty range site; windbreak suitability group 3.

Fm—Fillmore silt loam, 0 to 1 percent slopes. This deep, nearly level, poorly drained soil is in shallow depressions on loess-covered uplands and stream terraces. It generally is ponded after heavy rains. Areas are irregular in shape and range from 3 to 80 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 12 inches thick. The subsurface layer is gray, very friable silt loam about 5 inches thick. The subsoil is about 22 inches thick. It is dark gray silty clay in the upper part, gray silty clay in the next part, and grayish brown silty clay loam in the lower part. The underlying material to a depth of 60 inches is pale brown silt loam. In some areas the soil does not have a subsurface layer. In other areas it is very poorly drained.

Included with this soil in mapping are small areas of the well drained, friable Hall soils along the edges of the depressions and some areas of Hobbs soils in small drainageways that lead into the depressions. The Hobbs soils are stratified and contain less clay than the Fillmore soil. They are subject to occasional overflow but are well drained. Included soils make up 5 to 10 percent of the unit.

Permeability is very slow in the Fillmore soil, and available water capacity is high. Runoff is very slow or ponded. A seasonal high water table is perched 0.5 foot above the surface to 1.0 foot below. The soil commonly is very wet in the spring and early in summer. It is very droughty late in the growing season, however, because

the fine textured subsoil releases water slowly to plants. Organic matter content is moderate. The shrink-swell potential is high in the subsoil.

Most of the acreage of this soil is used for cultivated crops. Some supports native grass.

If used for dryland farming, this soil is suited to grain sorghum, wheat, forage crops, and water-tolerant grasses. It is limited as cropland, however, because it is ponded after spring rains. Ponded water commonly destroys alfalfa stands. Tillage and planting are often delayed, and crops are occasionally destroyed by ponded water after they are planted.

Managing this poorly drained soil for dryland crops is difficult because it generally occurs as small areas within fields where the other soils dominantly are well drained. Because of poor tilth and surface compaction, preparing a seedbed is difficult and stands of crops are poor. Competition from weeds is a problem because timely cultivation is difficult. Terraces, diversions, and a cover of crop residue in the higher surrounding areas reduce the amount of runoff received by the depressions. Chiseling temporarily increases the rate at which water moves through the soil. Returning crop residue to the soil increases the organic matter content and improves tilth. If the soil is irrigated, some land leveling generally is needed to remove surface water.

This soil is suited to introduced or native grasses for hay and grazing. Overgrazing and silt deposition, however, reduce the extent of the protective plant cover and cause deterioration of the native plant community. A planned grazing system that includes proper grazing use helps to keep the range in good condition.

This soil is poorly suited to the trees and shrubs grown as windbreaks. Because of the ponding in the spring, planting is difficult and survival poor. Trees and shrubs can be grown as special plantings in areas used as wildlife habitat if the selected species are very tolerant of water and special measures are used to keep the seedlings from drowning.

This soil is unsuitable as a septic tank absorption field because of the ponding and the very slow permeability and as a site for buildings because of the ponding and the high shrink-swell potential. A suitable alternative site should be selected. The ponding is a limitation on sites for sewage lagoons. It can be controlled by a special drainage system and by dikes.

The ponding, low strength, and frost action potential are limitations if this soil is used as a site for local roads. Building the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by ponding. Providing a gravel moisture barrier in the subgrade, crowning the roadbed by grading, and constructing adequate side ditches improve surface drainage and thus help to prevent the damage caused by frost action. Providing coarse grained subgrade or base material helps to overcome the low strength. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability unit is IIIw-2 dryland; Clayey Overflow range site; windbreak suitability group 2W.

Fo—Fillmore silt loam, drained, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is on low flats and in swales on loess-covered uplands. In some areas shallow depressions were filled when land was leveled, and in others drains have been installed to remove ponded water. The areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 11 inches thick. The subsurface layer is gray, friable silt loam about 6 inches thick. The subsoil is about 26 inches thick. It is dark gray clay in the upper part, grayish brown silty clay in the next part, and grayish brown silty clay loam in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous silt loam. The texture, thickness, and color of the surface soil vary widely because diverse soil material was used as fill when the drains were installed, when tailwater recovery pits were constructed, and when land was leveled. In some areas the soil is very poorly drained.

Included with this soil in mapping are cut areas. Very little fill material is in these areas, and the surface soil is thinner, finer textured, and more plastic than that of the Fillmore soil. Also included are small areas of Hall, Holdrege, and Hobbs silt loams between leveled and drained depressions. The surface soil of these soils is thicker and more friable than that of the Fillmore soil, and the subsoil is more permeable and less clayey. Included areas make up 5 to 15 percent of the unit.

Though a surface drainage system has been installed, runoff is slow on the Fillmore soil, permeability is very slow, and the intake rate is low. A seasonal high water table is perched within a depth of 1.0 foot. Available water capacity is high, but the claypan subsoil restricts the movement of water and releases moisture slowly to plants. Organic matter content is moderate. The shrink-swell potential is high in the subsoil.

Most of the acreage of this soil is used for cultivated crops that are irrigated. The rest is used for dryland crops.

If used for dryland farming, this soil is suited to wheat, sorghum, and alfalfa. Wheat is best suited because it matures before the hot and droughty part of the summer. A conservation tillage system that leaves crop residue on the surface increases the organic matter content, improves tilth, reduces evaporation, and increases the intake rate.

If irrigated, this soil is suited to corn, sorghum, alfalfa, and introduced grasses. Applying a proper amount of water is difficult because the soil generally occurs as small areas surrounded by siltier soils. Some of the larger areas can be irrigated separately. The claypan subsoil slows the intake rate and restricts the penetration of plant roots. The rate of application should

be adjusted so that water can soak in and yet not pond and drown the crop. Tailwater recovery systems conserve water. Returning crop residue to the soil increases the organic matter content, improves tilth, and increases the infiltration rate. If deep-rooted legumes and grasses are included in the cropping sequence, the subsoil is more porous. As a result, more moisture can enter the soil.

This soil is suited to introduced or native grasses for hay and grazing. Overgrazing or grazing when soil is too wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep pastures in good condition.

This soil is suited to the trees and shrubs commonly grown as windbreaks. Suitable species can survive well and grow fairly well if competing plants are removed or controlled. Plant competition can be controlled by good site preparation, timely cultivation, and applications of carefully selected herbicides. The droughty nature of this claypan soil is a limitation, especially in midsummer. Applying irrigation water increases survival rates.

This soil is unsuitable as a septic tank absorption field because of the very slow permeability and the wetness and as a site for buildings because of the wetness and the high shrink-swell potential. A suitable alternative site should be selected. The wetness is a limitation on sites for sewage lagoons. It generally can be overcome by building on fill material, so that the floor of the lagoon is a sufficient height above the seasonal high water table.

The wetness, low strength, and frost action potential are limitations if this soil is used as a site for local roads. Building the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by wetness. Providing a gravel moisture barrier in the subgrade, crowning the roadbed by grading, and constructing adequate side ditches improve surface drainage and thus help to prevent the damage caused by frost action. Providing coarse grained subgrade or base material helps to overcome the low strength. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability unit is IIw-2 dryland and irrigated; Clayey Overflow range site; windbreak suitability group 2W.

Go—Gosper loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is on the low stream terraces in the valley of the Platte River. It occurs as one area about 4.5 miles long and 400 to 1,300 feet wide. The area runs almost parallel to the river.

Typically, the surface soil is dark gray, very friable loam about 12 inches thick. The subsoil also is about 12 inches thick. The upper part is very dark grayish brown loam, and the lower part is grayish brown sandy clay loam. The upper part of the underlying material, to a depth of about 52 inches, is pale brown and brown fine sandy loam. The lower part, to a depth of about 60 inches, is pale brown loamy sand. The underlying material has soft, round accumulations and some concretions of lime. Coarse sand is at a depth of about 60 inches. In a few areas the underlying material has strata of silt loam, fine sandy loam, and fine sand.

Included with this soil in mapping are small areas of Cozad silt loam. This included soil does not have sand or gravel within a depth of 60 inches. Also included are small areas of Lex loam, which is less than 40 inches deep over sand and gravel, and a few small areas that are moderately affected by soluble salts. Included areas make up 10 to 15 percent of the unit.

Permeability is moderate in the upper part of the Gosper soil, but it is more rapid in the underlying material. Available water capacity is moderate. Runoff is slow. The water table is at a depth of 3 to 5 feet in the spring, but it drops to a depth of 8 feet or more late in summer. Organic matter content is moderate. The shrink-swell potential is moderate in the subsoil.

Most areas of this soil are used for cultivated crops. Many of the cultivated areas are irrigated. A small acreage supports native grass and is used for grazing.

If used for dryland farming, this soil is suited to wheat, grain sorghum, corn, and alfalfa. An insufficient amount of rainfall is the main limitation. Tillage practices that return crop residue to the soil or leave a protective plant cover on the surface conserve moisture, improve tilth, and help to control soil blowing. Alfalfa grows well in spring and early in summer because it benefits from rainfall and from the moisture provided by the seasonal high water table. It commonly does not grow well later in the summer, when the water table drops into the underlying sand and gravel.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. Either a gravity or a sprinkler system can be used. If a gravity system is used, leveling helps to achieve a uniform distribution of the water. The soil absorbs moisture easily and releases it readily to plants. The available water capacity is only moderate. If the amount of water applied exceeds the amount that the soil can hold, water is wasted and plant nutrients, principally nitrates, are leached into the rapidly permeable underlying material and the ground water. Carefully controlled applications of commercial fertilizer are needed if crops are grown year after year. Returning crop residue to the soil increases the organic matter content and the supply of plant nutrients and conserves water. Alfalfa is subirrigated until the water table drops into the underlying sand and gravel. Then, irrigation is needed.

This soil is suited to introduced or native grasses for hay and grazing. Overgrazing or untimely haying, however, reduces the extent of the protective plant cover and causes deterioration of the native plant community. Proper grazing use and timely deferment of grazing or haying help to keep the range in good condition.

This soil is suited to the trees and shrubs commonly grown as windbreaks. An insufficient amount of rainfall is

the main limitation. Seedlings survive and grow well only if competing grasses and weeds are removed or controlled by timely cultivation and by applications of carefully selected herbicides.

Septic tank absorption fields can function satisfactorily in this soil only if they are constructed on fill material, so that they are a sufficient height above the seasonal high water table. Otherwise, a suitable alternative site or a different waste disposal system should be selected. Seepage and wetness are limitations on sites for sewage lagoons. Lining or sealing the lagoon helps to prevent seepage. The wetness generally can be overcome by building on fill material, so that the floor of the lagoon is a sufficient height above the seasonal high water table.

The shrink-swell potential is a limitation if this soil is used as a site for buildings. Also, the wetness is a limitation on sites for dwellings with basements. Strengthening foundations and backfilling with coarse material help to prevent the damage caused by shrinking and swelling. Constructing dwellings with basements on elevated, well compacted fill material helps to overcome the wetness caused by the seasonal high water table.

The shrink-swell potential and frost action potential are limitations if this soil is used as a site for local roads. Mixing additives, such as hydrated lime, with the base material helps to prevent shrinking and swelling. Providing a gravel moisture barrier in the subgrade, crowning the roadbed by grading, and constructing adequate side ditches improve surface drainage and thus help to prevent the road damage caused by frost action.

The capability units are IIc-1 dryland and I-6 irrigated; Silty Lowland range site; windbreak suitability group 1.

Gt—Gothenburg fine sandy loam, 0 to 2 percent slopes. This nearly level, poorly drained or somewhat poorly drained soil is adjacent to the channel of the Platte River, on bottom land characterized by small ridges and drainageways. It is frequently flooded. It is very shallow over sand and gravel. Areas are long and narrow and range from 35 to 50 acres in size.

Typically, the surface soil is grayish brown fine sandy loam about 5 inches thick. The underlying material to a depth of 60 inches is light gray gravelly sand. It averages about 36 percent gravel. In some areas the surface soil is silt loam.

Included with this soil in mapping are small areas of Platte loam, which has surface soil that is thicker than that of the Gothenburg soil. Also included are some areas where sand and gravel are exposed. Included areas make up about 5 to 10 percent of the unit.

Permeability is moderately rapid in the surface soil of the Gothenburg soil and very rapid in the underlying material. Runoff is slow. Available water capacity is very low. The water table fluctuates between the surface and a depth of 2 feet in the spring and drops to a depth of 5 feet or more late in summer. The surface is very dry during periods when streamflow and the water table are low. Organic matter content is low.

Almost all areas of this soil support native vegetation and are used as rangeland. The vegetation is a mixture of native grass and scattered trees.

This soil is limited as grazing land because it has a shallow root zone. Overgrazing reduces the extent of the protective plant cover and causes deterioration of the native plant community. A planned grazing system that includes proper grazing use and timely deferment of grazing improves the range condition. If pits are dug to the depth of the water table, the resulting ponds can be used for watering livestock.

This soil is unsuited to the trees and shrubs commonly grown as windbreaks because it is flooded during periods when streamflow is high. Planted seedlings have a poor survival rate.

This soil is unsuitable as a site for buildings or sewage disposal facilities because of the flooding and the wetness caused by the seasonal high water table. Also, the effluent from the sanitary facilities can pollute ground water. A suitable alternative site should be selected. If local roads are built on this soil, providing suitable compacted fill material and adequate side ditches and culverts helps to prevent the damage caused by floodwater and by wetness. The underlying sand and gravel can be excavated and used as construction material.

The capability unit is VIIs-3 dryland; Subirrigated range site; windbreak suitability group 10.

Ha—Hall silt loam, 0 to 1 percent slopes. This deep, well drained, nearly level soil is at the lower elevations on broad divides in the loess-covered uplands. Areas are irregular in shape and range from 10 to 900 acres in size.

Typically, the surface soil is dark grayish brown, friable silt loam about 14 inches thick. The subsoil is silty clay loam about 26 inches thick. The upper part is dark grayish brown, and the lower part is grayish brown. The underlying material to a depth of 60 inches is silt loam. The upper part is light brownish gray, and the lower part is light gray. In places the soil is dark to a depth of less than 20 inches. In some areas the content of clay in the subsoil is less than 28 percent, and in others it is as much as 40 percent.

Included with this soil in mapping are small areas of Fillmore and Hobbs soils. Hobbs soils are stratified throughout. They are in swales or small drainageways. Fillmore soils contain more clay in the subsoil than the Hall soil. They are poorly drained and are in swales. Included soils make up less than 10 percent of the unit.

Permeability is moderate in the Hall soil. Runoff is slow. Available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate.

Most of the acreage of this soil is used for cultivated crops that are irrigated. The rest generally is used for dryland crops. Small, irregularly shaped areas adjacent to steep canyons support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to wheat and grain sorghum and to grasses and legumes for hay and pasture. An insufficient amount of rainfall is the main limitation. Soil blowing is a hazard if the surface is without a plant cover. Tillage practices that keep crop residue or vegetation on the surface help to control soil blowing, maintain tilth, and conserve moisture. Burning crop residue is not a desirable practice.

If irrigated, this soil is suited to corn, grain sorghum, alfalfa, and soybeans and to mixed grasses and legumes for hay and pasture. Either gravity or sprinkler systems can be used. Timely application and proper distribution of the water are needed. Tailwater recovery pits and land leveling help to prevent waste of water and fertilizer. Returning crop residue to the soil, planting green manure crops, and applying manure increase the organic matter content, help to control soil blowing, and increase the infiltration rate.

This soil is suited to introduced grasses for pasture or hay. Haying or grazing when the soil is wet, however, causes surface compaction. Timely deferment of grazing or haying and restricted use during wet periods help to keep the grasses in good condition.

This soil is suitable as rangeland. Overgrazing and untimely haying, however, reduce the extent of the protective plant cover and cause deterioration of the native plant community. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to keep the range in good condition.

This soil is suited to the trees and shrubs commonly grown as windbreaks. An insufficient amount of rainfall is the main limitation. Seedlings generally can survive and grow well only if competing plants are controlled or removed. Plant competition can be controlled by good site preparation, by timely cultivation, and by applications of carefully selected herbicides.

Septic tank absorption fields can function satisfactorily in this soil, but the moderate permeability is a limitation. Increasing the size of the absorption area helps to overcome this limitation. Seepage is a limitation on sites for sewage lagoons. It generally can be overcome by lining or sealing the lagoon.

This soil is suitable as a building site, but the shrink-swell potential is a limitation. Strengthening foundations and backfilling with coarse material help to prevent the damage caused by shrinking and swelling. Low strength is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability units are IIc-1 dryland and I-4 irrigated; Silty range site; windbreak suitability group 3.

HaB—Hall silt loam, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil is at the slightly lower elevations on broad divides in the loess-covered uplands. It commonly is on side slopes or in swales at the upper end of drainageways. Areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface soil is dark grayish brown, friable silt loam about 16 inches thick. The subsoil is silty clay loam about 16 inches thick. The upper part is dark grayish brown, and the lower part is grayish brown. The underlying material to a depth of 60 inches is light brownish gray silt loam. It has threads and soft accumulations of lime. In a few areas the surface soil is stratified with soil material from higher slopes. In some areas the soil is dark to a depth of less than 20 inches.

Included with this soil in mapping are small areas of Hord soils. These soils do not have the strongly expressed subsoil characteristic of the Hall soil. They make up about 10 percent of the unit.

Permeability is moderate in the Hall soil, and available water capacity is high. Runoff is medium. Organic matter content is moderate. The shrink-swell potential also is moderate.

Most of the acreage of this soil is used for cultivated crops. More than half is irrigated.

If used for dryland farming, this soil is suited to wheat and grain sorghum and to grasses and legumes for hay and pasture. Soil blowing and water erosion are moderate hazards unless the surface is protected by crops or crop residue. A conservation tillage system that leaves crop residue on the surface helps to control soil blowing and water erosion and conserves moisture by reducing runoff and evaporation rates. Returning crop residue to the soil and applying manure increase the organic matter content, improve tilth, and increase the water intake rate and the available water capacity. Terraces, diversions, contour farming, and grassed waterways help to control water erosion.

If irrigated, this soil is well suited to corn, alfalfa, and soybeans and to introduced grasses or grass and legume mixtures for hay and grazing. Water erosion is the chief hazard. A conservation tillage system that leaves crop residue on the surface is needed. Adjusting the rate at which water is applied to the intake rate of the soil helps to prevent excessive runoff and erosion. If slopes are uniform, level benches or parallel terraces constructed at a proper grade can help to control erosion. Grassed waterways remove excess water without excessive soil loss.

Gravity or sprinkler systems can be used on this soil. Timely application and efficient distribution of water are needed. Less land preparation is needed if a sprinkler system is used. If a gravity system is used, a proper grade is needed. This commonly can be achieved by land leveling. In leveled areas the organic matter content can be increased by returning crop residue to the soil and by applying barnyard manure. Reducing the grade in the row by adjusting the direction of the row helps to distribute the water evenly. It also helps to control erosion. Tailwater recovery pits can be used in areas where siltation is controlled.

A cover of pasture plants or of hay is effective in controlling soil blowing and water erosion. Haying or grazing when the soil is wet, however, causes surface

compaction. Proper stocking rates, pasture rotation, timely deferment of haying and grazing, and restricted use during wet periods help to keep the grasses in good condition.

A cover of native grasses is very effective in controlling soil blowing and water erosion. Overgrazing or improper stocking rates, however, reduce the extent of the protective plant cover and cause deterioration of the native plant community. A planned grazing system that includes proper grazing use and timely deferment of grazing or haying help to keep the range in good condition.

This soil is suited to the trees and shrubs commonly grown as windbreaks. Seedlings generally survive and grow well if competing plants are controlled or removed. Plant competition can be controlled by good site preparation, by timely cultivation, and by applications of carefully selected herbicides.

Septic tank absorption fields can function satisfactorily in this soil, but the moderate permeability is a limitation. Increasing the size of the absorption area helps to overcome this limitation. Seepage is a limitation on sites for sewage lagoons. It generally can be overcome by lining or sealing the lagoon.

This soil is suitable as a building site, but the shrink-swell potential is a limitation. Strengthening foundations and backfilling with coarse material help to prevent the damage caused by shrinking and swelling. Low strength is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability units are IIe-1 dryland and IIe-4 irrigated; Silty range site; windbreak suitability group 3.

Hd—Hobbs silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on the bottom of drainageways in the uplands. It is occasionally flooded for brief periods. Areas are long and narrow and range from 10 to 150 acres in size.

Typically, the surface soil is dark grayish brown, very friable silt loam about 8 inches thick. The underlying material to a depth of 60 inches is stratified, grayish brown, light brownish gray, dark grayish brown, light gray, and brown silt loam. In places the soil has thin layers of fine sandy loam and very fine sandy loam. In some areas the surface soil is limy because silt from steeply sloping adjacent areas has been deposited.

Included with this soil in mapping are small areas of Cozad and Hord soils. These soils are slightly higher on the landscape than the Hobbs soil and are not flooded so often. Also, Cozad soils contain less clay and Hord soils have a more strongly expressed structure and are not stratified. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Hobbs soil, and available water capacity is high. Runoff is slow. Organic matter content is moderate.

More than half of the acreage of this soil is rangeland or pasture. The rest is used for cultivated crops. Some areas are irrigated. Many areas are too small or narrow for access by modern farm equipment.

If used for dryland farming, this soil is suited to wheat and grain sorghum and to introduced grasses and legumes for hay and pasture. Flooding is a hazard. In some areas it can be controlled by dikes or embankments.

If irrigated, this soil is suited to corn, alfalfa, and introduced grasses or grass and legume mixtures. It commonly is managed as part of a larger field. Both gravity and sprinkler systems are suitable. Measures that control floodwater and the runoff and erosion on the higher surrounding soils generally are needed. Examples are contour farming, terraces, diversions, grassed waterways, and tillage practices that keep crop residue on the surface of the higher areas. A cover of pasture grasses and legumes on this soil and on the surrounding soils is effective in controlling erosion.

This soil is suited to introduced and native grasses. A cover of these grasses is very effective in controlling soil blowing and water erosion. Overgrazing and silt deposition, however, reduce the extent of the protective plant cover and cause deterioration of the native plant community. A planned grazing system that includes proper grazing use helps to keep the range in good condition.

This soil is suited to the trees and shrubs commonly grown as windbreaks. Trees survive and grow well if competing plants are removed or controlled. Plant competition can be controlled by good site preparation, by timely cultivation, and by applications of carefully selected herbicides. The occasional flooding is a hazard. In some areas, runoff should be diverted or the windbreak should be designed to conform to the natural drainage pattern.

Because it is subject to flooding, this soil is unsuitable as a site for sanitary facilities or buildings. A suitable alternative site should be selected. The flooding and low strength are limitations on sites for local roads. If roads are built across areas of this soil, providing suitable compacted fill material and adequate side ditches and culverts helps to prevent the damage caused by floodwater. The low strength generally can be overcome by providing coarse grained subgrade or base material. A surface pavement that is thick enough to compensate for the low strength also is helpful. The soil is a good source of topsoil for topdressing areas where fertility is lower.

The capability units are IIw-3 dryland and IIw-6 irrigated; Silty Overflow range site; windbreak suitability group 1.

HeB—Hobbs silt loam, channeled, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, well drained soil is on low bottoms along the major creeks and in some large upland drainageways. It is frequently flooded, generally during spring rains, but the

water drains away within a few hours. Channels dissect most areas. Those along many of the major creeks are 25 to 30 feet deep. Commonly, the channel banks are abrupt and the areas adjacent to the channel are uneven. In some creeks the streamflow from springs is continuous. Areas are long and narrow and range from 50 to 1,000 acres in size.

Typically, the surface soil is grayish brown, friable silt loam about 6 inches thick. The underlying material to a depth of 60 inches is very stratified, dark grayish brown and grayish brown silt loam. In some areas the soil has thin layers of very dark grayish brown silt loam or very fine sandy loam. In other areas lime is within a depth of 40 inches.

Included with this soil in mapping are small areas of Cozad and Hord soils at the slightly higher elevations. Cozad soils contain less clay than the Hobbs soil. Hord soils have a more strongly expressed profile than the Hobbs soil and are less stratified. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Hobbs soil, and available water capacity is high. Runoff is slow or medium, depending on the slope in the drainageway. Organic matter content generally is moderate. It is low, however, in areas that have been subject to recent erosion or siltation.

All areas support native grass and are used for grazing. This soil is suitable as rangeland. Very good forage production can be expected. The floodwater promotes the growth of mid and tall grasses. The native trees and the channels provide natural shelter for livestock. Overgrazing reduces the extent of the protective plant cover and causes deterioration of the native plant community. A planned grazing system that includes proper grazing use helps to keep the range in good condition.

This soil is unsuited to cultivated crops because it is dissected by entrenched channels that are too deep and too steep to be crossed by ordinary farm equipment. The smooth areas adjacent to the channels cannot be cultivated because they are small and irregular in shape, because they are frequently flooded and receive deposits of sediment and debris during periods of flooding, and because they are subject to streambank erosion.

This soil is unsuited to the trees and shrubs commonly grown as windbreaks. Because of the deep channels, the uneven topography, and the flooding, survival is poor and hand planting commonly is the only feasible planting method. Some trees and shrubs can be established on wildlife habitat if the sites are carefully selected and specially managed.

This soil is suited to openland and rangeland wildlife habitat. The areas that support grass are interspersed with areas that support trees and generally are close to areas used for grain crops. As a result, the habitat provides good cover and food for rabbits, upland game birds, and deer. Fresh water is available in the stream channels most of the year and in the spring-fed streams throughout the year.

Because it is subject to flooding, this soil is unsuitable as a site for sanitary facilities or buildings. A suitable alternate site should be selected. The flooding and low strength are limitations on sites for local roads. If roads are built across areas of this soil, providing suitable compacted fill material and adequate side ditches and culverts helps to prevent the damage caused by floodwater. The low strength generally can be overcome by providing coarse grained subgrade or base material. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability unit is VIw-7 dryland; Silty Overflow range site; windbreak suitability group 10.

Ho—Holdrege silt loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on the loess-covered uplands. Areas generally are irregular in shape and range from 10 to 400 acres in size.

Typically, the surface soil is friable silt loam about 14 inches thick. It is grayish brown in the upper part and dark grayish brown in the lower part. The subsoil is silty clay loam about 10 inches thick. It is grayish brown in the upper part and brown in the lower part. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam. In some areas land leveling has exposed the subsoil or underlying material. In some areas the soil is dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Coly, Fillmore, and Uly soils. Coly and Uly soils contain less clay in the subsoil than the Holdrege soil and are shallower to lime. Fillmore soils contain more clay in the subsoil. They are in swales and are somewhat poorly drained or poorly drained. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Holdrege soil. The water intake rate is reduced in areas where the silty clay loam subsoil is exposed. Runoff is slow. Available water capacity is high. Organic matter content is moderate, and tilth generally is good. The soil is deficient in plant nutrients in areas where land leveling has removed the surface soil. The shrink-swell potential is moderate.

Most of the acreage of this soil is used for irrigated crops. The rest is used for dryland crops.

If used for dryland farming, this soil is suited to wheat, grain sorghum, and oats and to introduced grasses and legumes for hay and pasture. Soil blowing is a slight hazard unless the surface is protected by vegetation or crop residue. The supply of moisture commonly is insufficient at some time during the growing season. A conservation tillage system that leaves crop residue on the surface when the fields are not protected by crops helps to control soil blowing and conserves moisture. Returning crop residue to the soil and applying barnyard manure increase the organic matter content, improve tilth, and increase the infiltration rate and the available water capacity.

If irrigated, this soil is suited to corn, alfalfa, grain sorghum, and soybeans and to introduced grasses and legumes for hay and pasture. A conservation tillage system that leaves crop residue on the surface is needed because soil blowing is a slight hazard if the surface is bare. The crop residue increases the organic matter content, improves tilth, helps to prevent surface compaction, and increases the infiltration rate. Timely application and efficient distribution of irrigation water are needed. Gravity or sprinkler irrigation systems can be used. Gravity systems are well suited. Some land leveling commonly is needed. In areas where leveling has exposed the subsoil, applications of barnyard manure and of crop residue are needed to increase the organic matter content, improve tilth, and increase the water intake rate. Tillage should be avoided when the soil is very wet or very dry.

This soil is suited to introduced grasses and legumes for pasture or hay. Haying or grazing when the soil is too wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the grasses in good condition.

This soil is suitable as rangeland. Overgrazing or untimely haying, however, reduces the extent of the protective plant cover and causes deterioration of the native plant community. A planned grazing system that includes proper grazing use and timely deferment of grazing or haying help to keep the range in good condition.

This soil is suited to the trees and shrubs commonly grown as windbreaks. An insufficient amount of rainfall is the main limitation. Seedlings generally survive and grow well only if competing plants are removed or controlled. Plant competition can be controlled by timely cultivation and by applications of carefully selected herbicides.

Septic tank absorption fields can function satisfactorily in this soil, but the moderate permeability is a limitation. Increasing the size of the absorption area helps to overcome this limitation. Seepage is a limitation on sites for sewage lagoons. It can be overcome by lining or sealing the lagoon.

This soil is suitable as a building site, but the shrink-swell potential is a limitation. Strengthening foundations and backfilling with coarse material help to prevent the damage caused by shrinking and swelling. Low strength is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability units are IIe-1 dryland and I-4 irrigated; Silty range site; windbreak suitability group 3.

HoB—Holdrege silt loam, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil is on divides in the loess-covered uplands. Areas are irregular in shape and range from 5 to 500 acres in size.

Typically, the surface soil is dark grayish brown, very friable silt loam about 12 inches thick. The subsoil is silty clay loam about 11 inches thick. The upper part is dark grayish brown, the next part is grayish brown, and the lower part is light brownish gray. The underlying material to a depth of 60 inches is light gray silt loam. In places the soil is dark to a depth of more than 20 inches. In some areas land leveling has exposed the subsoil or underlying material. A few areas are eroded.

Included with this soil in mapping are small areas of Coly and Uly soils, generally on the steeper sides of ridges. These soils contain less clay in the subsoil than the Holdrege soil and are shallower to lime. They make up 5 to 15 percent of the unit.

Permeability is moderate in the Holdrege soil. Runoff is medium. Available water capacity is high. Organic matter content is moderate. The soil is deficient in plant nutrients in some leveled areas. The shrink-swell potential is moderate.

Most of the acreage of this soil is used for irrigated crops. The rest mainly is used for dryland crops. Small areas adjacent to the steeper canyons are used as rangeland.

If used for dryland farming, this soil is suited to wheat, grain sorghum, and oats and to introduced grasses and legumes for hay and pasture. Soil blowing and water erosion are moderate hazards, however, unless the surface is protected by crops or crop residue. The supply of moisture commonly is insufficient. A conservation tillage system that leaves crop residue on the surface when the fields are not protected by crops helps to control soil blowing and water erosion and conserves moisture. Returning crop residue to the soil and applying manure improve tilth and increase the organic matter content and the available water capacity. Terraces, contour farming, and grassed waterways help to control water erosion (fig. 10).

If irrigated, this soil is suited to corn, alfalfa, and soybeans and to introduced grasses and grass and legume mixtures for hay and pasture. Water erosion is the chief hazard. A conservation tillage system that leaves crop residue on the surface is needed. Adjusting the rate at which water is applied to the intake rate of the soil helps to prevent excessive runoff and erosion. If slopes are uniform, level benches or parallel terraces constructed at a proper grade can help to control erosion.

Gravity or sprinkler systems can be used on this soil (fig. 11). Less land preparation is needed if a sprinkler system is used. Timely application and efficient distribution of water are needed. If a gravity system is used, a proper grade is needed. This commonly can be achieved by land leveling. In leveled areas, the organic matter content can be increased by returning crop residue to the soil. Also, tilth and fertility can be improved by applying barnyard manure. The soil commonly is deficient in phosphorus and zinc in these areas. Reducing the grade in the row by adjusting the direction of the row helps to distribute the water evenly. It also helps to control erosion and increases the intake

rate. Tailwater recovery systems can be constructed to conserve water.

A cover of pasture plants or of hay is effective in controlling soil blowing and water erosion. Haying or grazing when the soil is wet, however, causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A cover of native grasses is very effective in controlling soil blowing and water erosion. Overgrazing or untimely haying, however, reduces the extent of the protective plant cover and causes deterioration of the native plant community. A planned grazing system that

Figure 10.—Terraces and contour farming on Holdrege silt loam, 1 to 3 percent slopes.

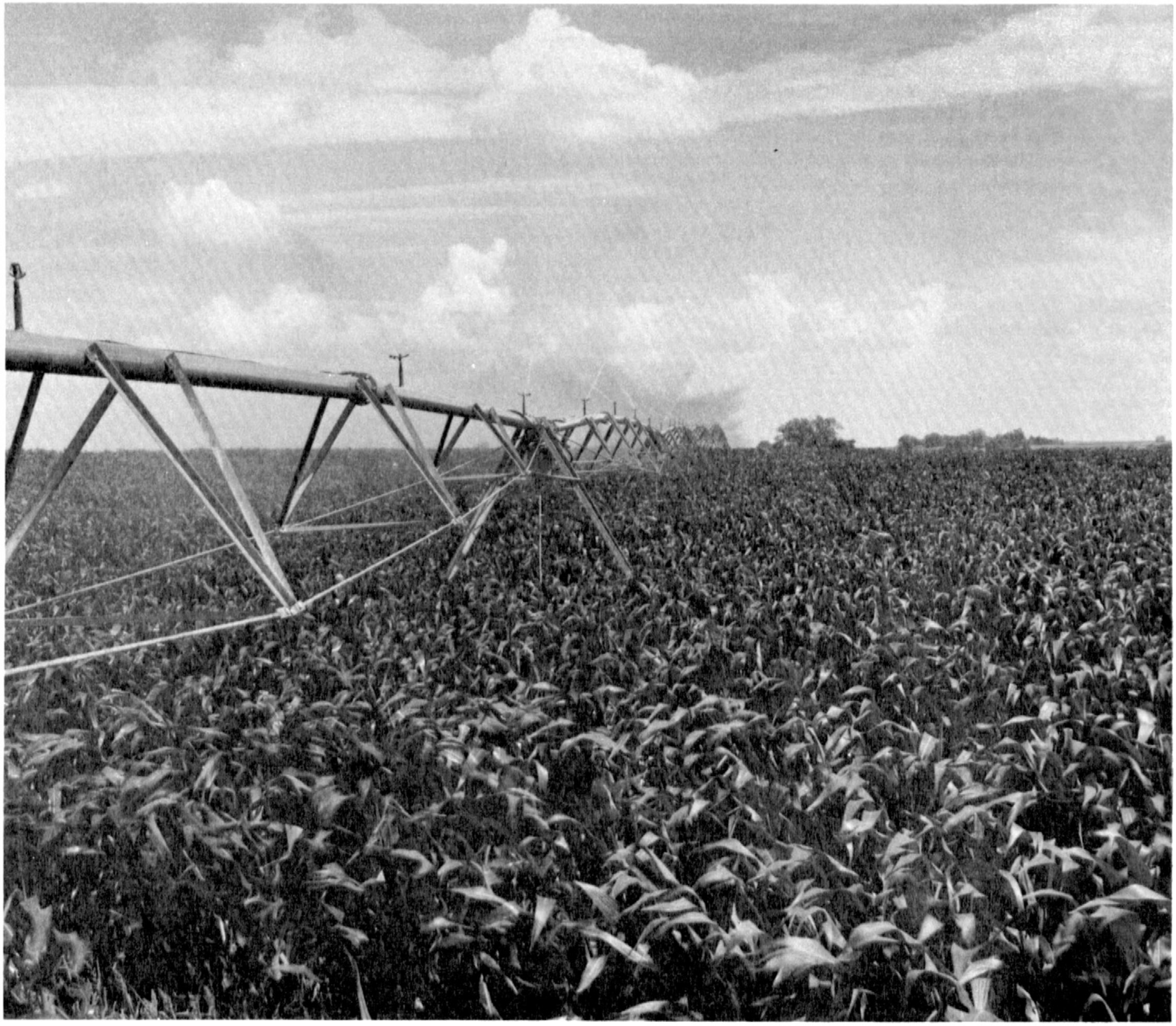

Figure 11.—An automatic sprinkler irrigation system on Holdrege silt loam, 1 to 3 percent slopes.

includes proper grazing use and timely deferment of grazing or haying help to keep the range in good condition.

This soil is suited to the trees and shrubs commonly grown as windbreaks. An insufficient amount of rainfall is the main limitation. Seedlings generally survive and grow well only if competing plants are controlled or removed. Plant competition can be controlled by good site preparation, by timely cultivation, and by applications of carefully selected herbicides.

Septic tank absorption fields can function satisfactorily in this soil, but the moderate permeability is a limitation. Increasing the size of the absorption area helps to overcome this limitation. Seepage and slope are limitations on sites for sewage lagoons. Lining or sealing the lagoon helps to prevent seepage. Grading is needed to modify the slope and shape the lagoon.

This soil is suitable as a building site, but the shrink-swell potential is a limitation. Strengthening foundations and backfilling with coarse material help to prevent the

damage caused by shrinking and swelling. Low strength is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability units are IIe-1 dryland and IIe-4 irrigated; Silty range site; windbreak suitability group 3.

HoC—Holdrege silt loam, 3 to 6 percent slopes. This deep, gently sloping, well drained soil is on side slopes and divides and along intermittent drainageways in the loess-covered uplands. Slopes generally are plane and convex. Areas are irregular in shape and range from 4 to 110 acres in size.

Typically, the surface soil is dark grayish brown silt loam about 8 inches thick. The subsoil is silty clay loam about 12 inches thick. The upper part is dark grayish brown, and the lower part is grayish brown. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam. The soil has threads and soft, round accumulations of lime. In a few areas depth to the underlying material is less than 20 inches.

Included with this soil in mapping are small areas of Coly and Uly soils, generally on the steeper slopes. These soils are shallower to lime than the Holdrege soil and contain less clay in the subsoil. They make up 5 to 15 percent of the unit.

Permeability is moderate in the Holdrege soil, and available water capacity is high. Runoff is medium. Organic matter content is moderately low. The shrink-swell potential is moderate.

Most of the acreage of this soil supports native grass and is used for grazing. Some areas are used for cultivated crops.

If used for dryland farming, this soil is suited to wheat, to grain and forage sorghums, and to introduced grasses and legumes for hay and pasture. Oats and rye are also grown. Water erosion is a moderate hazard. Soil blowing also is a hazard if the surface is bare. An insufficient amount of rainfall is a limitation. A conservation tillage system that leaves crop residue on the surface when the fields are not protected by crops helps to control soil blowing and water erosion. Terraces and contour farming reduce the runoff rate and help to control water erosion. Returning crop residue to the soil, planting green manure crops, and applying barnyard manure increase the organic matter content, improve fertility and tilth, increase the water intake rate, and conserve moisture. Close growing crops should be included in the cropping system. Burning crop residue is not a good practice.

If irrigated by a sprinkler system and adequately protected against water erosion, this soil is suited to corn and alfalfa and to introduced grasses and grass and legume mixtures for hay and pasture. A conservation tillage system that leaves crop residue on the surface, a cropping system that includes close growing crops, terraces, and grassed waterways help to control runoff and water erosion. Slot planting and no-till planting are suitable conservation tillage systems. Adjusting the rate of water application to the intake rate of the soil reduces the runoff rate and conserves water.

This soil is poorly suited to gravity irrigation because the rows generally are too steep. Erosion and runoff are excessive, and applied fertilizers are often washed to lower levels on the landscape. Gravity irrigation is suitable only in areas where slopes are uniform and contour bench leveling or a combination of contour furrow irrigation and terraces effectively controls runoff and water erosion.

A cover of hay or pasture plants is effective in controlling soil blowing and water erosion. Border irrigation can be used, especially on the more gentle slopes. Overgrazing or untimely haying reduces the extent of the protective plant cover and increases the runoff rate and the susceptibility to erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

A cover of native grasses is effective in controlling soil blowing and water erosion. Overgrazing, however, reduces the extent of the protective plant cover, causes deterioration of the native plant community, and increases the susceptibility to water erosion. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to keep the range in good condition.

This soil is suited to the trees and shrubs commonly grown as windbreaks. An insufficient amount of rainfall is the main limitation. Seedlings generally survive and grow well only if competing plants are controlled or removed. Plant competition can be controlled by good site preparation and by timely cultivation or applications of carefully selected herbicides.

Septic tank absorption fields can function satisfactorily in this soil, but the moderate permeability is a limitation. Increasing the size of the absorption area helps to overcome this limitation. Seepage and slope are limitations on sites for sewage lagoons. Lining or sealing the lagoon helps to prevent seepage. Grading is needed to modify the slope and shape the lagoon.

This soil is suitable as a building site, but the shrink-swell potential is a limitation. Also, the slope is a limitation on sites for small commercial buildings. Strengthening foundations and backfilling with coarse material help to prevent the damage caused by shrinking and swelling. The design of small commercial buildings should accommodate the slope. Otherwise, grading is needed. Low strength is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability units are IIIe-1 dryland and IIIe-4 irrigated; Silty range site; windbreak suitability group 3.

HpB—Holdrege-Uly silt loams, 1 to 3 percent slopes. These deep, very gently sloping, well drained

soils are on ridgetops and convex slopes on upland divides, commonly at the higher elevations. Areas are irregular in shape and range from 5 to 100 acres in size. They are about 45 percent Holdrege soil and 45 percent Uly soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

Typically, the surface layer of the Holdrege soil is dark grayish brown silt loam about 6 inches thick. The subsoil is about 14 inches thick. The upper part is dark grayish brown silty clay loam, and the lower part is light brownish gray silt loam. The underlying material to a depth of 60 inches is light gray, calcareous silt loam. In a few areas depth to the underlying material is less than 20 inches.

Typically, the surface layer of the Uly soil is grayish brown, firm silt loam about 6 inches thick. The subsoil is silty clay loam about 9 inches thick. The upper part is grayish brown, and the lower part is light brownish gray. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

Included with these soils in mapping are small areas of Coly and Hobbs soils. These included soils contain less clay than the Holdrege and Uly soils and take in water more rapidly. The Coly soils are on the upper slopes. The Hobbs soils are in small swales and drainageways. They are stratified because they receive soil material from areas higher on the landscape. Included soils make up about 10 percent of the unit.

Permeability is moderate in the Holdrege and Uly soils. Runoff is medium. Available water capacity is high. Organic matter content generally is moderate but is moderately low in some areas. The intake rate is slower in areas where the organic matter content is lower. The shrink-swell potential is moderate in the Holdrege soil.

Most areas of these soils are used for cultivated crops. Many of the cultivated areas are irrigated.

If used for dryland farming, these soils are suited to wheat and grain and forage sorghums (fig. 12) and to introduced grasses and legumes for hay and pasture. Soil blowing and water erosion are hazards unless the surface is adequately protected by vegetation or crop residue. An insufficient amount of rainfall is a limitation. A conservation tillage system that keeps crops or crop residue on the surface at all times helps to control soil blowing and water erosion and conserves moisture. Terraces and contour farming reduce the runoff rate and help to control erosion. Grassed waterways help to control erosion after heavy rains. Returning crop residue to the soil, planting green manure crops, and applying barnyard manure increase the organic matter content, improve fertility, and increase the water intake rate.

Figure 12.—Temporary pasture in an area of Holdrege-Uly silt loams, 1 to 3 percent slopes.

Heavy applications of fertilizer generally are needed in the areas used for dryland crops. The soils commonly are deficient in nitrogen and phosphorus. Additions of trace minerals occasionally are needed. Care is needed in applying herbicides. Applications should not be too heavy in the areas where the organic matter content is moderately low.

If irrigated, these soils are suited to corn, grain sorghum, and alfalfa and to introduced grasses or grass and legume mixtures for hay and pasture. Irrigation water can be applied by sprinklers or by a gravity system if a nonerosive grade can be achieved in the rows. Water erosion is the main hazard. The same conservation tillage practices and the same measures for improving fertility are needed in the irrigated areas as are needed in the areas used for dryland farming. Burning crop residue is not a desirable practice. The soil should not be tilled when wet and plastic.

Careful management of irrigation water is needed. If sprinklers are used, the rate of application should not exceed the intake rate of the soil. Excessive runoff results if the intake rate is exceeded. Land leveling is needed if gravity irrigation is used. Reducing the grade in the row and controlling the length of the run and the amount of water applied help to meet the needs of the crop without causing excessive erosion. Adjusting the direction of the row to the shape of the slope commonly can reduce the grade to a nonerosive level. Level benches or parallel terraces that have a proper grade can be used if slopes are uniform. Occasional deep chiseling increases the intake rate and thus reduces the runoff rate. Tailwater recovery systems can be installed to conserve water in the areas irrigated by a gravity system.

A cover of pasture plants or hay is effective in controlling soil blowing and water erosion. Grazing or haying when the soil is wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A cover of native grasses is very effective in controlling soil blowing and water erosion. Overgrazing or untimely haying, however, reduces the extent of the protective plant cover and causes deterioration of the native plant community. A planned grazing system that includes proper grazing use and timely deferment of grazing or haying help to keep the range in good condition.

These soils are suited to the trees and shrubs commonly grown as windbreaks. An insufficient amount of rainfall is the main limitation. Seedlings generally survive and grow well only if competing plants are controlled or removed. Plant competition can be controlled by good site preparation, by timely cultivation, and by applications of carefully selected herbicides.

Septic tank absorption fields can function satisfactorily in these soils, but the moderate permeability of the Holdrege soil is a limitation. Increasing the size of the absorption area helps to overcome this limitation. Seepage and slope are limitations on sites for sewage lagoons. Sealing or lining the lagoon helps to prevent seepage. Grading is needed to modify the slope and shape the lagoon.

These soils are suitable as sites for buildings, but the shrink-swell potential of the Holdrege soil is a limitation. Strengthening foundations and backfilling with coarse material help to prevent the damage caused by shrinking and swelling. Low strength is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability units are IIe-8 dryland and IIe-4 irrigated; Silty range site; windbreak suitability group 3.

HpC2—Holdrege-Uly silt loams, 3 to 6 percent slopes, eroded. These deep, gently sloping, well drained soils are on ridgetops and convex side slopes on upland divides and on short slopes directly above steep upland canyons. Much of the original dark surface soil has eroded away. The rest has been mixed with the upper part of the subsoil by tillage and in many areas is plastic when wet and cloddy when dry. In some areas the calcareous underlying material is exposed. Rills and small gullies form after rains of moderate intensity in areas without a plant cover.

Areas of these soils are irregular in shape and range from 5 to 200 acres in size. They are about 40 percent Holdrege soil and 40 percent Uly soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

Typically, the surface layer of the Holdrege soil is dark grayish brown, firm silt loam about 8 inches thick. The subsoil is about 6 inches thick. It is grayish brown silty clay loam in the upper part and light brownish gray silt loam in the lower part. The underlying material to a depth of 60 inches is light gray, calcareous silt loam. The depth to threads and soft, round accumulations of lime is about 14 inches.

Typically, the surface layer of the Uly soil is grayish brown silt loam about 5 inches thick. Most of the original subsoil has been mixed with the surface layer by tillage. The rest is light brownish gray silt loam about 4 inches thick. The underlying material to a depth of 60 inches is calcareous silt loam. It is pale brown in the upper part, very pale brown in the next part, and pale brown in the lower part. It has threads and soft, round accumulations of lime.

Included with these soils in mapping are small areas of Coly soils. These included soils are shallower to lime than the Holdrege and Uly soils. They make up about 20 percent of the unit.

Permeability is moderate in the Holdrege and Uly soils. Runoff is medium. Available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate in the Holdrege soil.

Most of the acreage of these soils is used for dryland

crops. Some areas are irrigated, mostly by sprinklers. A few areas, commonly adjacent to steeper areas, have been reseeded to native grass.

If used for dryland farming, these soils are suited to wheat, to grain and forage sorghums, and to introduced grasses and legumes for hay and pasture. Water erosion is a severe hazard in cultivated areas. Soil blowing also is a hazard in bare areas. An insufficient amount of rainfall is a limitation in most years. A conservation tillage system that leaves crop residue on the surface helps to control soil blowing and water erosion. Returning crop residue to the soil, planting green manure crops, and applying barnyard manure increase the organic matter content, improve tilth, increase the water intake rate, and help to control erosion. The crop residue should not be burned. Close growing crops should be planted more often than row crops. Terraces and contour farming reduce the runoff rate and the risk of erosion.

These soils commonly are deficient in nitrogen and phosphorus. The phosphorus tends to be insoluble in these calcareous soils and is not available to plants. It should be applied each year. Applications of herbicide should not be heavy because the organic matter content is moderately low.

If irrigated by sprinklers and adequately protected against water erosion, these soils are suited to corn and alfalfa and to introduced grasses and legumes for hay and pasture. A conservation tillage system that leaves crop residue on the surface is needed. Terraces and contour farming reduce the runoff rate and help to control erosion. Close growing crops should be planted more often than row crops. Irrigation water should not be applied at a rate that exceeds the intake rate of the soils. Because of the hazard of erosion, the soils are poorly suited to gravity irrigation if the direction of the rows is downslope. Contour bench leveling or a combination of contour irrigation and parallel terraces can help to reduce the gradient in areas where slopes are uniform. Land leveling generally is needed if a gravity system is used.

A cover of pasture plants or hay is effective in controlling soil blowing and water erosion. Haying or grazing when the soils are too wet, however, causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A cover of native grasses is effective in controlling soil blowing and water erosion. Overgrazing or untimely haying, however, reduces the extent of the protective plant cover and causes deterioration of the native plant community. A planned grazing system that includes proper stocking rates and timely deferment of grazing or haying help to keep the range in good condition.

These soils are suited to the trees and shrubs commonly grown as windbreaks. An insufficient amount of rainfall is the main limitation. Seedlings generally survive and grow well only if competing plants are controlled or removed. Plant competition can be controlled by good site preparation and by timely cultivation or applications of carefully selected herbicides. Soil blowing and water erosion are hazards before the seedlings are established. Cover crops between the rows and contour planting help to prevent excessive soil loss.

Septic tank absorption fields can function satisfactorily in these soils, but the moderate permeability of the Holdrege soil is a limitation. Increasing the size of the absorption area helps to overcome this limitation. Slope and seepage are limitations on sites for sewage lagoons. Sealing or lining the lagoon helps to prevent seepage. Grading is needed to modify the slope and shape the lagoon.

These soils are suitable as building sites, but the shrink-swell potential of the Holdrege soil is a limitation. Also, the slope of both soils is a limitation on sites for small commercial buildings. Strengthening foundations and backfilling with coarse material help to prevent the damage caused by shrinking and swelling. The design of small commercial buildings should accommodate the slope. Otherwise, grading is needed. Low strength is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability units are IIIe-8 dryland and IIIe-4 irrigated; Silty range site; windbreak suitability group 3.

Hr—Hord silt loam, terrace, 0 to 1 percent slopes. This deep, level, well drained soil is on terraces along the major streams and creeks. Areas are irregular in shape and range from 5 to 250 acres in size.

Typically, the surface soil is dark grayish brown, friable silt loam about 14 inches thick. The subsoil is friable and very friable silt loam about 16 inches thick. The upper part is dark grayish brown, and the lower part is grayish brown. The upper part of the underlying material is pale brown, very friable silt loam. The lower part to a depth of 60 inches is grayish brown, friable silty clay loam. In some areas the surface soil is less than 14 inches thick because of land leveling for irrigation.

Included with this soil in mapping are small areas of Cozad, Hall, and Hobbs soils. Cozad soils are at the slightly higher elevations. Their dark surface soil is thinner than that of the Hord soil, and the subsoil contains less clay. Hall soils are in shallow depressions or on low benches along the major streams. Their subsoil is finer textured than that of the Hord soil. Hobbs soils are in swales and on low flats along drainageways. They are subject to occasional overflow and are stratified. Also included are a few areas in small depressions that are moderately affected by soluble salts. Included areas make up 5 to 10 percent of the unit.

Permeability is moderate in the Hord soil, and

available water capacity is high. Runoff is slow. Organic matter content is moderate. The soil is easy to work and releases water readily to plants.

Most areas of this soil are used for irrigated crops. The rest are used for dryland crops.

If used for dryland farming, this soil is well suited to wheat and grain sorghum and to introduced grasses or grass and legume mixtures for hay and pasture. An insufficient amount of moisture during years when the amount of rainfall is below normal is the main limitation. Soil blowing is a hazard if the surface is bare. A conservation tillage system that leaves crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue to the soil increases the organic matter content and improves fertility and tilth.

If irrigated, this soil is suited to corn and alfalfa. A conservation tillage system that leaves crop residue on the surface generally is needed. Both gravity and sprinkler irrigation systems can be used. Gravity systems are more common because a proper grade generally can be obtained with a minimum of land leveling and because water penetrates the surface and moves through the soil at a uniform rate (fig. 13). If an excessive amount of water is applied, however, plant nutrients are easily leached below the root zone. The amount applied should be determined by the amount that the soil can hold. Tailwater recovery systems conserve water and improve the efficiency of irrigation.

This soil is suited to range but generally is not used for that purpose. A planned grazing system that includes proper grazing use helps to keep the range in good condition.

If irrigated, this soil is suited to grasses or grass and legume mixtures for hay and pasture. Border dikes or similar structures help to distribute water more efficiently. A planned grazing system that includes proper stocking rates helps to keep the pasture in good condition.

This soil is suited to the trees and shrubs commonly grown as windbreaks. An insufficient amount of rainfall is the main limitation. Seedlings survive and grow well only if competing weeds and grasses are controlled or removed. Plant competition can be controlled by good site preparation, by timely cultivation, and by applications of carefully selected herbicides in the row.

Septic tank absorption fields function well in this soil. Seepage is a limitation on sites for sewage lagoons. Lining or sealing the lagoon helps to overcome this limitation.

This soil is suitable as a building site. Low strength is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability units are IIc-1 dryland and I-6 irrigated; Silty Lowland range site; windbreak suitability group 1.

HrB—Hord silt loam, terrace, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil is on stream terraces and colluvial foot slopes. Areas are irregular in shape and range from 5 to 25 acres in size.

Typically, the surface soil is very friable silt loam about 12 inches thick. It is dark grayish brown in the upper part and very dark grayish brown in the lower part. The subsoil is very friable silt loam about 12 inches thick. It is very dark grayish brown in the upper part and dark grayish brown in the lower part. The underlying material to a depth of 60 inches is pale brown silt loam. It is slightly calcareous at a depth of about 46 inches.

Included with this soil in mapping are small areas of the very gently sloping Cozad soils. These soils are dark to a depth of less than 20 inches. Their subsoil contains less clay than that of the Hord soil. Also included, in swales and drainageways, are small areas of Hobbs soils, which are occasionally flooded by runoff from the surrounding uplands and are stratified. Included soils make up 5 to 10 percent of the unit.

Permeability and the water intake rate are moderate in the Hord soil. Available water capacity is high. Runoff commonly is slow but is medium on the convex foot slopes. Organic matter content is moderate. The soil generally is easy to work and releases water readily to plants.

Most of the acreage of this soil is used for cultivated crops. A few small areas on the terraces along the smaller creeks are used as pasture.

If used for dryland farming, this soil is suited to wheat, grain sorghum, and alfalfa and to grasses and legumes for hay and pasture. Soil blowing is a slight hazard unless the surface is protected by crop residue or vegetation. Water erosion is a moderate hazard. A conservation tillage system that leaves crop residue on the surface helps to control soil blowing and water erosion. Planting row crops on the contour, terracing, and establishing grassed waterways and field borders help to control runoff and water erosion. Returning crop residue to the soil and applying barnyard manure increase the organic matter content, improve tilth, increase the water intake rate, and conserve moisture.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa and to introduced grasses or grass and legume mixtures for hay and pasture. Soil blowing is a slight hazard and water erosion a moderate hazard. A conservation tillage system that leaves crop residue on the surface is needed. The rate at which irrigation water is applied should be carefully controlled. Excessive runoff and erosion result from an application rate that exceeds the intake rate of the soil. Grassed waterways, bench leveling, and the least possible grade in the rows, which can be attained by adjusting the direction of the rows, help to control runoff and erosion.

Gravity or sprinkler irrigation systems can be used on this soil. If a gravity system is used, land leveling and shaping generally are needed. Less land preparation is

needed if sprinklers are used. Tailwater recovery systems help to conserve water.

This soil is suited to pasture or hay. A cover of introduced grasses or hay is effective in controlling soil blowing and water erosion. Overgrazing, however, increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A cover of native grasses is very effective in controlling soil blowing and water erosion. Overgrazing or untimely haying, however, reduces the extent of the protective plant cover and causes deterioration of the native plant community. A planned grazing system that

Figure 13.—A gravity irrigation system on Hord silt loam, terrace, 0 to 1 percent slopes.

includes proper grazing use and timely deferment of grazing or haying help to keep the range in good condition.

This soil is suited to the trees and shrubs commonly grown as windbreaks. An insufficient amount of rainfall is a limitation. Seedlings generally survive and grow well only if competing plants are controlled or removed. Plant competition can be controlled by good site preparation, by timely cultivation, and by applications of carefully selected herbicides. Planting on the contour helps to control erosion and conserves moisture.

Septic tank absorption fields can function well in this soil. Seepage and slope are limitations on sites for sewage lagoons. Lining or sealing the lagoon helps to prevent seepage. Grading is needed to modify the slope and shape the lagoon.

This soil is suitable as a site for buildings. Low strength is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability units are IIe-1 dryland and IIe-6 irrigated; Silty Lowland range site; windbreak suitability group 1.

Hw—Hord silt loam, wet substratum, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on stream terraces in the valley of the Platte River and on terraces along upland creeks. It is subject to rare flooding. Areas are irregular in shape. They range from 5 to 45 acres in size along the upland creeks and from 40 to 135 acres in the valley of the Platte River.

Typically, the surface soil is dark grayish brown, friable silt loam about 12 inches thick. The subsoil is friable silt loam about 21 inches thick. The upper part is grayish brown, the next part is dark grayish brown, and the lower part is grayish brown. The upper part of the underlying material is grayish brown silt loam. The lower part to a depth of 60 inches is gray silt loam. The lower part of the subsoil and the underlying material have few, faint, light brownish gray mottles. In some areas the soil is dark to a depth of less than 20 inches. In an area in the valley of the Platte River, gravel is at a depth of 5 or 6 feet.

Included with this soil in mapping are small areas of Cozad silt loam and another Hord silt loam at the slightly higher elevations and small areas of saline or alkali soils in shallow depressions. Cozad soils are dark to a depth of less than 20 inches. Their subsoil contains less clay than that of the Hord soil. Also included are a few areas that are very poorly drained. Included areas make up 10 to 15 percent of the unit.

Permeability is moderate in this Hord soil, and available water capacity is high. Runoff is slow. Organic matter content is moderate. Depth to a seasonal high water table ranges from about 2 feet in wet years to 4 feet in dry years.

Most areas of this soil are used for cultivated crops. Those on the terraces along Plum Creek are used for dryland crops, and those in the valley of the Platte River generally are irrigated.

If used for dryland farming, this soil is suited to corn, grain sorghum, and alfalfa and to introduced grasses and legumes for hay and pasture. The main limitation is the wetness in spring and early in summer. As a result of the wetness, tillage is difficult and planting commonly is delayed. Installing drains can reduce the wetness if adequate outlets are available. Alfalfa and other deep-rooted crops can obtain moisture from the water table. Soil blowing is a slight hazard unless the surface is protected by crop residue or vegetation. Returning crop residue to the soil and applying commercial fertilizer increase the organic matter content and improve tilth and fertility.

If irrigated, this soil is suited to corn and grain sorghum and to legumes and introduced grasses for hay and pasture. The seasonal wetness is the main limitation, and soil blowing is a hazard. A conservation tillage system that leaves crop residue on the surface is needed. Irrigation water is needed during the part of the summer when the water table is lower. If outlets are available, open or tile drains can be used to lower the seasonal high water table. Land leveling improves surface drainage and water distribution in areas where a gravity system is used. If sprinklers are used, less land preparation is needed, but measures that control surface ponding are needed. The soil commonly is deficient in nitrogen and phosphorus. Nitrogen should not be applied in excessive amounts because it is easily leached into the water table.

A cover of range plants that are used for either grazing or haying is very effective in controlling soil blowing. Overgrazing or untimely haying, however, reduces the extent of the protective plant cover and causes deterioration of the native plant community. Also, grazing when soil is wet causes surface compaction and results in the formation of small mounds in many areas. Proper grazing use, timely deferment of grazing or haying, and restricted use during wet periods help to keep the range in good condition.

This soil is suited to some of the trees and shrubs commonly grown as windbreaks and as plantings in recreational areas and in areas used as wildlife habitat. The species selected for planting should be those that are tolerant of the seasonal high water table. Establishing the seedlings can be difficult during wet years. Also, persistent plant competition from herbaceous vegetation is a problem. Good site preparation, timely cultivation, and applications of carefully selected herbicides help to control weeds and increase survival rates. Once established, the trees can draw moisture from the water table.

The seasonal high water table is a limitation if this soil is used as a site for septic tank absorption fields or sewage lagoons. It generally can be overcome by constructing on

fill material, so that the absorption field or the bottom of the lagoon is a sufficient height above the seasonal high water table.

The flooding is a hazard if this soil is used as a site for buildings. Also, the seasonal high water table is a limitation on sites for dwellings with basements. Building on elevated, well compacted fill material helps to prevent the damage caused by flooding and wetness. Low strengths is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability units are IIw-4 dryland and IIw-3 irrigated; subirrigated range site; windbreak suitability group 2S.

Le—Lex loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on bottom land in the valley of the Platte River. It is subject to rare flooding. It is moderately deep over sand and gravel. Areas are long and narrow and parallel the river. They range from 5 to 210 acres in size.

Typically, the surface soil is about 24 inches thick. It is dark gray loam and gray silt loam in the upper part, dark gray silty clay loam in the next part, and dark grayish brown loam in the lower part. The lower part has common, medium, distinct, light gray mottles. The upper part of the underlying material is pale brown loam that has common, medium, faint, grayish brown mottles. The next part is light gray fine sand. The lower part to a depth of 60 inches is pale brown and light gray gravelly sand that has many, medium, distinct, reddish brown mottles. In a few small areas the surface soil is fine sandy loam.

Included with this soil in mapping are small areas of Gosper and Platte loams. The Gosper soils are more than 40 inches deep over sand and gravel. The Platte soils are less than 20 inches deep over sand and gravel. They have been leveled in many areas. Also included are a few small areas of saline soils in shallow, isolated depressions. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the upper part of the Lex soil and very rapid in the underlying sand and gravel. Available water capacity is moderate. Runoff is slow. Organic matter content is moderate. Fertility varies. It is affected by a high content of calcium and by moderate and strong alkalinity. The supply of available phosphorus commonly is low. Depth to a seasonal high water table ranges from 1.5 feet in wet years to 3 feet in dry years.

More than half of the areas of this soil are used for cultivated crops. The rest either support native grass or are building sites. Almost all of the cultivated areas are irrigated.

If used for dryland farming, this soil is fairly well suited to corn and grain sorghum. Tillage and planting commonly are delayed by wetness in the spring. The soil is droughty late in summer, however, when the water table drops into the underlying sand and gravel. Roots cannot effectively penetrate the sand and gravel. Alfalfa is subirrigated in the spring and early in summer, but irrigation is needed later in the growing season. Soil blowing is a hazard if the surface is bare. It can be controlled by a conservation tillage system that leaves crop residue on the surface.

If irrigated, this soil is suited to corn, alfalfa, and grain sorghum. The amount of water that can be applied is limited by the moderate available water capacity of the soil. Limiting the amount that is applied to the amount that the soil can hold conserves water. If an excessive amount is applied, plant nutrients are leached below the root zone. Returning crop residue to the soil and applying barnyard manure increase the organic matter content.

A gravity irrigation system can be used on this soil only if a proper grade can be achieved. Some land leveling is needed, but it is difficult because any substantial cuts expose the underlying sand and gravel. The length of the run should be shorter than that on soils having a higher available water capacity. If the run is too long, plant nutrients are leached below the root zone. The length of the period of each application and the timespan between applications should also be shorter.

A sprinkler system is better suited than a gravity irrigation system. The water can be controlled more effectively, and very little land preparation is needed. Filling or draining small depressions helps to control ponding and prevents the accumulation of soluble salts. The amount of water applied and the time of application should be closely controlled. Fertilizers can be efficiently applied through the sprinklers.

This soil is suited to the grasses and legumes grown for hay and pasture. A cover of these plants is effective in controlling erosion. Overgrazing, however, reduces the productivity of the soil and the extent of the protective plant cover. Proper grazing use, timely deferment of grazing, and pasture rotation help to keep the pasture in good condition.

A cover of range plants that are used for either grazing or haying is effective in controlling soil blowing. Overgrazing or untimely haying, however, reduces the extent of the protective plant cover and causes deterioration of the native plant community. Also, grazing when the soil is wet causes surface compaction and results in the formation of hummocks. Proper grazing use, timely deferment of grazing or haying, and restricted use during very wet periods help to keep the range in good condition.

This soil is suited to some of the trees and shrubs commonly grown as windbreaks. The species selected for planting should be those that are tolerant of the seasonal high water table. Establishing the seedlings can be difficult during wet years. Also, persistent plant

competition from herbaceous vegetation is as problem. It can be controlled by good site preparation, by timely cultivation, and by applications of carefully selected herbicides.

The very rapid permeability and the wetness caused by the seasonal high water table are limitations if this soil is used as a site for septic tank absorption fields or sewage lagoons. Also, the flooding is a hazard on sites for sewage lagoons. Because of the very rapid permeability, the effluent can pollute ground water. Lining or sealing sewage lagoons helps to prevent seepage. Diking protects the lagoons from floodwater. The wetness can be overcome by constructing on fill material, so that the absorption field or the bottom of the lagoon is a sufficient height above the seasonal high water table.

The flooding is a hazard if this soil is used as a site for buildings. Also, the wetness caused by the seasonal high water table is a limitation on sites for dwellings with basements. Constructing the buildings on elevated, well compacted fill material helps to overcome both the flooding and the wetness. Installing a sump pump also reduces the wetness.

Frost action and low strength are limitations if this soil is used as a site for local roads. Providing a gravel moisture barrier in the subgrade, crowning the roadbed by grading, and constructing adequate side ditches improve surface drainage and thus help to prevent the road damage caused by frost action. Providing coarse grained subgrade or base material helps to overcome the low strength. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability units are IIIw-4 dryland and IIIw-7 irrigated; Subirrigated range site; windbreak suitability group 2S.

Lf—Lex loam, saline-alkali, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on bottom land in the valley of the Platte River. It is subject to rare flooding. It is moderately deep over sand and gravel. Areas are irregular in shape and range from 10 to 40 acres in size.

Typically, the surface soil is about 18 inches thick. The upper 6 inches is dark gray loam. The next 3 inches is gray silt loam that has common, medium, distinct, light brownish gray mottles. It is strongly alkaline. The lower 9 inches is dark gray clay loam that has common, medium, distinct, light brownish gray mottles. It is very strongly alkaline and is moderately affected by soluble salts. The upper part of the underlying material, to a depth of about 24 inches, is grayish brown fine sandy loam that has common, fine, distinct, light brownish gray mottles. It is strongly alkaline and is moderately affected by soluble salts. The next part, to a depth of about 38 inches, is pale brown sand. The lower part to a depth of 60 inches is yellowish brown gravelly sand. In some areas the excess soluble salts are at a depth of 20 to 30 inches.

Included with this soil in mapping are small areas of Gosper loam and another Lex loam. These soils are not affected by salinity or alkalinity. They make up 2 to 6 percent of the unit.

Runoff is slow on this Lex soil. Permeability is moderately slow in the surface soil and very rapid in the underlying sand and gravel. Available water capacity is moderate, but the soil releases water slowly to plants because of the excess salts. Organic matter content is moderate. Depth to the seasonal high water table ranges from about 2 feet in wet years to 5 feet in dry years.

Most areas of this soil are used for cultivated crops. Many of the cultivated areas are irrigated. A few small areas support native grass.

This soil is poorly suited to dryland crops. Alfalfa, grain sorghum, and introduced grasses are grown. In some areas rye is grown as a cover crop or is used for grazing. Plant growth is moderately affected by the excess soluble salts or the strong salinity on about 40 percent of each area. It is most affected in the small depressions or drainageways. The salinity and alkalinity are especially toxic to plants during dry periods. Soil blowing is a hazard if the surface is bare. It can be controlled by leaving crop residue on the surface. Returning crop residue to the soil and applying barnyard manure increase the organic matter content and improve tilth. Crops commonly respond to applications of phosphate fertilizer. The amount applied should not exceed the immediate needs of the crop because phosphorus can form insoluble compounds in this strongly alkaline soil.

The wetness caused by the seasonal high water table and the slow runoff commonly delay tillage and planting in the spring. Filling small depressions improves surface drainage and thus helps to keep soluble salts from concentrating at the surface. These salts tend to accumulate as standing water evaporates. Deep chiseling temporarily improves internal drainage and permits some leaching of soluble salts. Alfalfa is subirrigated until the water table drops into the underlying sand and gravel. After the water table drops, the alfalfa cannot grow because of the lack of water. Stands are thin and growth is retarded in the saline or strongly alkaline areas.

If irrigated, this soil is suited to corn, alfalfa, grain sorghum, and introduced grasses. The management needs generally are the same as those in the areas used for dryland crops. Carefully applying irrigation water can help to overcome the droughty and toxic conditions caused by the high alkalinity or the excess soluble salts. Land leveling helps to achieve a proper grade and results in good surface drainage. It is difficult, however, because deep cuts can expose the underlying sand and gravel. Even if sprinklers are used, the small depressions and poorly defined drainageways should be filled because soluble salts tend to accumulate near the surface in areas where internal drainage is slow and standing water evaporates. The amount and kind of commercial fertilizer to be applied should be based on

systematic soil tests. The degree of salinity and alkalinity should be ascertained because it commonly determines the availability of plant nutrients.

This soil is suited to some introduced grasses for hay and pasture. The species selected for planting should be those that are tolerant of the seasonal high water table and the saline-alkali conditions. A cover of introduced grasses is effective in controlling soil blowing. Overgrazing, however, reduces the extent of the protective plant cover. Grazing when the soil is too wet causes surface compaction, especially in the areas most affected by salinity and alkalinity. Proper grazing use, timely deferment of grazing, and rotation grazing help to keep the pasture in good condition.

This soil is suitable as rangeland. A cover of range plants is effective in controlling soil blowing. Overgrazing or untimely haying, however, reduces the extent of the protective plant cover and causes deterioration of the native plant community. Also, grazing when the soil is too wet causes surface compaction and results in the formation of small mounds. Proper grazing use, timely deferment of grazing or haying, and restricted use during wet periods help to keep the range in good condition.

This soil is poorly suited to most of the trees and shrubs commonly grown as windbreaks. The species that are tolerant of the moderate salinity or alkalinity can surive and grow fairly well. Competition from weeds and grasses can be controlled by cultivating between the tree rows with conventional equipment. In the row and close to the trees, it can be controlled by hoeing or rototilling. Establishing the seedlings is difficult during wet years. Planting should be delayed until the soil is sufficiently dry.

The very rapid permeability and the wetness caused by the seasonal high water table are limitations if this soil is used as a site for septic tank absorption fields or sewage lagoons. Also, the flooding is a hazard on sites for sewage lagoons. Because of the very rapid permeability, the effluent can pollute ground water. Lining or sealing sewage lagoons helps to prevent seepage. Diking protects the lagoons from floodwater. The wetness can be overcome by constructing on fill material, so that the absorption field or the bottom of the lagoon is a sufficient height above the seasonal high water table.

The flooding is a hazard if this soil is used as a site for buildings. Also, the wetness caused by the seasonal high water table is a limitation on sites for buildings with basements. Constructing the buildings on elevated, well compacted fill material helps to overcome both the flooding and the wetness. Installing a sump pump also reduces the wetness.

Frost action is a hazard if this soil is used as a site for local roads. Providing a gravel moisture barrier in the subgrade, crowning the roadbed by grading, and constructing adequate side ditches improve surface drainage and thus help to prevent the road damage caused by frost action.

The capability units are IVs-1 dryland and IIIw-6 irrigated; Saline Subirrigated range site; windbreak suitability group 9S.

Pt—Platte loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on bottom land in the valley of the Platte River. It is occasionally flooded. It is shallow over sand and gravel. Areas are mainly long and narrow and parallel the river. They range from 10 to 90 acres in size.

Typically, the surface soil is dark gray loam about 5 inches thick. The upper part of the underlying material, to a depth of about 12 inches, is light gray fine sandy loam. The next part, to a depth of about 20 inches, is light gray coarse sand. The lower part to a depth of 60 inches is light gray gravelly coarse sand in which the content of gravel is about 42 percent. The soil is calcareous above the sand and gravel.

Included with this soil in mapping are small areas of Lex loam, which is moderately deep over sand and gravel, and small areas of Gothenburg loam, which is very shallow over sand and gravel. The Gothenburg soil is along old drainageways. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the upper part of the Platte soil and very rapid in the underlying sand and gravel. Available water capacity is low. Runoff is slow. Organic matter content is moderately low. Depth to a seasonal high water table ranges from about 1 foot in wet years to 2 feet in dry years. The soil is very droughty late in summer, when the streamflow is low.

Almost all areas of this soil support native grasses and are used for grazing. One small area is cultivated.

This soil is unsuitable for cultivation because it has a high water table in the spring, is occasionally flooded, and is droughty in the summer, when the water table drops below the root zone of most plants. It is better suited to grasses for pasture or hay.

This soil is suitable as rangeland. Overgrazing or untimely haying, however, reduces the extent of the protective plant cover and causes deterioration of the native plant community. Also, grazing when the soil is wet causes surface compaction. Proper grazing use, timely deferment of grazing or haying, and restricted use during wet periods help to keep the range in good condition.

This soil is suited to some of the trees and shrubs commonly grown as windbreaks. The species selected for planting should be those that are tolerant of the seasonal high water table. Also, the seedlings should be those that can survive the droughty periods in the summer. Applying additional water during the summer increases survival rates in the first year. Good site preparation and removal of competing weeds and grasses by cultivation also increase survival rates. Herbicides should be applied very carefully on this very rapidly permeable soil.

Because of the flooding and the wetness caused by the seasonal high water table, this soil is unsuitable as a site for sanitary facilities or buildings. Because of the

very rapid permeability, the effluent from sanitary facilities can pollute ground water. A suitable alternative site for buildings or sanitary facilities should be selected. The sand and gravel can be excavated and used as construction material.

The flooding is a hazard if this soil is used as a site for local roads. Building the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and wetness.

The capability unit is VIw-4 dryland; Subirrigated range site; windbreak suitability group 2S.

Sc—Scott silty clay loam, 0 to 1 percent slopes. This deep, nearly level, very poorly drained soil is in depressions in the loess-covered uplands. It is frequently ponded, generally for periods of 7 days to 1 month but in some areas for longer periods. Areas are irregular in shape and range from 5 to 150 acres in size.

Typically, the surface layer is dark gray, friable silty clay loam about 3 inches thick. The subsurface layer is gray, friable silt loam about 3 inches thick. The subsoil is about 30 inches thick. It is dark gray, firm silty clay in the upper part; grayish brown, firm silty clay loam in the next part; and grayish brown, friable silty clay loam in the lower part. The underlying material to a depth of 60 inches is light brownish gray silt loam. In some cultivated areas tillage has mixed the surface layer, the subsurface layer, and the upper part of the subsoil. The resulting plow layer has a high content of clay. In some ponded areas on stream terraces, the soil contains less clay. Most of the water in these areas has seeped through the saturated substratum in areas of the Hord silt loam that has a wet substratum. In some areas, the soil is poorly drained, water ponds for a shorter period, and the surface soil is more than 6 inches thick.

Included with this soil in mapping are small areas of the well drained Hall and Holdrege soils. These soils are in the higher areas along the edges of the depressions. Their subsoil contains less clay than that of the Scott soil. Included soils make up about 5 percent of the unit.

Permeability is very slow in the Scott soil. Available water capacity is high. Runoff is very slow, and water ponds on the surface after rains. A seasonal high water table is perched 0.5 foot above the surface to 1 foot below. The subsoil is very hard when dry. Tillage is difficult because the soil is too wet when ponded and too hard when dry. Organic matter content is moderate. The shrink-swell potential is high in the subsoil.

More than half of the acreage of this soil is used for cultivated crops. The rest mainly is used for wildlife habitat. Waterfowl are hunted in some areas.

This soil is poorly suited to cultivated crops because of the very poor drainage and poor tilth. Ponding is a severe hazard. Crops are often lost after rains. Competition from weeds is a problem. Controlling the weeds by cultivation is not feasible during the extended periods when the surface soil is saturated. Because of the poor tilth, preparing a good seedbed is difficult. As a result, stands of cultivated crops are poor. Grain sorghum is the best suited dryland crop. Land leveling and cultivating generally mix the surface soil with the clayey part of the subsoil. As a result, tilth deteriorates further. Soil compaction is a problem if the soil is worked in the spring, when it is wet. Because of a slow water intake rate, managing the soil for irrigated crops is difficult.

Managing cultivated areas is very difficult because seedling emergence commonly is poor on this soil and the plant population is lower than that on the surrounding soils, which can support a high population. If applied as anhydrous ammonia, much nitrogen is lost because the clay in this soil prevents sealing of the applicator knife slot. Fall tillage and limited cultivation in the spring improve tilth and help to prevent surface compaction. Returning crop residue to the soil increases the organic matter content, improves fertility, and increases the infiltration rate.

This soil generally is unsuitable as grazing land because of the frequent ponding. The vegetation commonly is smartweed and other aquatic plants of little value as livestock feed. Seeded native grasses are not likely to survive because of the very poor drainage. The pasture grasses that can tolerate wetness can be grown to a limited extent. Keeping the stand in good condition and controlling weeds are problems. Grazing when the soil is wet causes surface compaction and damages the grasses. If grazing is deferred during wet periods, the grasses commonly will be grazed late in the growing season, when they are less palatable.

This soil is unsuited to the trees and shrubs grown as windbreaks unless special practices are applied to improve the drainage and overcome the other limitations.

Because of the ponding and the very slow permeability this soil is unsuitable as a septic tank absorption field. A central sanitary sewer is a suitable waste disposal system. The ponding is a hazard on sites for sewage lagoons. It can be controlled by diking.

Because of the ponding and the high shrink-swell potential, this soil is unsuitable as a building site. A suitable alternative site should be selected. The ponding, low strength, and frost action potential are limitations on sites for local roads. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by ponding. Providing a gravel moisture barrier in the subgrade, crowning the roadbed by grading, and constructing adequate side ditches improve surface drainage and thus help to prevent the damage caused by frost action. Providing coarse grained subgrade or base material helps to overcome the low strength. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability unit is IVw-1 dryland and the windbreak suitability group 10; no range site is assigned.

UbD—Uly silt loam, 6 to 9 percent slopes. This deep, strongly sloping, well drained soil is on ridgetops and along the smooth sides of upland drainageways. Areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is silt loam about 11 inches thick. The upper part is dark grayish brown, and the lower part is grayish brown and calcareous. The underlying material to a depth of 60 inches is light gray, calcareous silt loam. It has soft, round accumulations of lime.

Included with this soil in mapping are small areas of the gently sloping Holdrege soils in swales or on high flats and small areas of the strongly sloping Coly soils on ridgetops. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the Uly soil, and available water capacity is high. Runoff is medium. Organic matter content is moderate.

Almost all areas support native grass and are used for grazing. This soil is suited to introduced or native grasses. A cover of these grasses is very effective in controlling soil blowing and water erosion. Overgrazing or untimely haying, however, reduces the extent of the protective plant cover and causes deterioration of the native plant community. Overgrazing also can result in severe water erosion. A planned grazing system that includes proper grazing use and timely deferment of grazing or haying help to keep the range in good condition.

This soil is poorly suited to cultivated crops. It is very susceptible to water erosion if the grass cover is removed. A protective cover of close growing crops is needed at all times. Alfalfa, grain sorghum, and wheat can be grown. Terraces, contour farming, grassed waterways, and a conservation tillage system that leaves crop residue on the surface are needed. The amount of rainfall does not meet the needs of the crop in some years.

This soil is poorly suited to irrigation. Sprinkler irrigation is the only practical method of water application. Alfalfa and introduced grasses are the best suited irrigated crops. If grown at all, row crops should be limited to only 1 year or to 2 years in succession. Carefully managing the rate of water application helps to prevent excessive water loss.

This soil is suited to the trees and shrubs commonly grown as windbreaks. The supply of moisture is insufficient during periods when the amount of rainfall is below average. Seedlings generally survive and grow well only if competing plants are controlled or removed. Plant competition can be controlled by good site preparation, by timely cultivation, and by applications of carefully selected herbicides. Water erosion is a severe hazard. Contour planting and tillage practices that leave a protective plant cover between the rows help to prevent excessive soil losses and increase the water intake rate. Terraces can control or divert the runoff from higher parts of the landscape.

Septic tank absorption fields can function well in this soil. Because of the slope, however, very few sites are suitable for sewage lagoons. Extensive grading is needed to modify the slope and shape the lagoon.

This soil is suitable as a site for buildings, but the slope is a limitation on sites for small commercial buildings. The design of the commercial buildings should accommodate the slope. Otherwise, grading is needed. Low strength is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability units are IVe-1 dryland and IVe-6 irrigated; Silty range site; windbreak suitability group 3.

UbE—Uly silt loam, 9 to 15 percent slopes. This deep, moderately steep, somewhat excessively drained soil is along upland drainageways and on ridges between the drainageways. Slopes commonly are smooth and convex, but some of the steeper ones are characterized by small catsteps. Areas are irregular in shape and range from 5 to 70 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is silt loam about 14 inches thick. The upper part is grayish brown, and the lower part is light brownish gray. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

Included with this soil in mapping are small areas of the strongly sloping and moderately steep Coly soils on high ridgetops and the moderately sloping Holdrege soils at the lower elevations. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the Uly soil, and available water capacity is high. Runoff is moderately rapid. Organic matter content is moderate.

Almost all areas support native grass and are used as rangeland. This soil is suitable as rangeland. A cover of range plants is very effective in controlling water erosion. Overgrazing or untimely haying, however, reduces the extent of the protective plant cover and causes deterioration of the native plant community. Overgrazing also can result in severe water erosion. A planned grazing system that includes proper grazing use and timely deferment of grazing or haying help to keep the range in good condition.

This soil is unsuited to cultivated crops because the hazard of water erosion is severe. Removal of the native grass cover greatly increases soil losses and causes downstream siltation.

This soil is suited to the trees and shrubs grown as windbreaks. An insufficient amount of rainfall is a limitation. Planting moderately drought resistant species helps to overcome this limitation. Seedlings generally survive and grow well only if competing plants are controlled or removed. Plant competition can be

controlled by good site preparation, by timely cultivation, and by applications of carefully selected herbicides. Water erosion is a severe hazard. Contour planting and tillage practices that leave a protective plant cover between the rows help to prevent excessive soil losses and increase the water intake rate. Also, preparing only the area where the tree row is to be established helps to control erosion on the steeper slopes. Terraces can be used to divert runoff.

Septic tank absorption fields can function well in this soil, but the slope is a limitation. Grading the site and installing the distribution lines on the contour help to overcome this limitation. The runoff from the higher elevations should be diverted from the field. The slope is a limitation on sites for sewage lagoons. Extensive grading is needed to modify the slope and shape the lagoon.

This soil is suitable as a site for buildings, but the slope is a limitation. The design of the buildings should accommodate the slope. Otherwise, grading is needed. Low strength is a limitation on sites for local roads. Providing coarse grained subgrade or base material helps to overcome this limitation. A surface pavement that is thick enough to compensate for the low strength also is helpful.

The capability unit is VIe-1; Silty range site; windbreak suitability group 3.

UcF—Uly-Coly silt loams, 9 to 30 percent slopes. These deep, moderately steep and steep, somewhat excessively drained soils are along upland drainageways and on high ridges between the drainageways. The Uly soil is on the long, smooth, plane or slightly concave slopes descending from the high divide to the narrow canyon or to the base of short side slopes. The Coly soil is at the crest of the ridges and on the abrupt slopes adjacent to the narrow canyon bottoms. Areas commonly are long and very irregular in shape and range from 10 to 700 acres in size. They are about 50 percent Uly soil and 40 percent Coly soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Uly soil has a surface layer of grayish brown, very friable silt loam about 7 inches thick. The subsoil is silt loam about 8 inches thick. It is dark grayish brown in the upper part and grayish brown in the lower part. The underlying material to a depth of 60 inches is light gray silt loam. It has threads and round accumulations of lime.

Typically, the Coly soil has a surface layer of grayish brown, very friable silt loam about 5 inches thick. Below this is a transition layer of brown, calcareous silt loam about 2 inches thick. The underlying material to a depth of 60 inches is pale brown silt loam. It has threads and soft, round accumulations of lime.

Included with these soils in mapping are areas where reddish and grayish brown loess is exposed at the base of side slopes, in the drainageways extending south towards the Republican River, and on the lower parts of some canyons. Also included are areas, generally at the head of upland drainageways, where discontinuous strata of fine sandy loam and fine sand are in the underlying material and areas at the base of side slopes in the southern part of the county where limy sandstone crops out and lime concretions and small pockets of gravel are exposed. Included areas make up 5 to 10 percent of the unit.

Runoff is rapid on the Uly and Coly soils. Permeability is moderate. Available water capacity is high. Both soils release moisture readily to plants. Organic matter content is moderate in the Uly soil and moderately low in the Coly soil.

Nearly all areas of these soils support native grass and are used for grazing. Some small areas on the canyon bottoms have been cultivated, but the soils are unsuited to cultivated crops. Removal of the grass cover results in severe water erosion.

These soils are suitable as rangeland. Water erosion is the chief hazard. Overgrazing or untimely haying reduces the extent of the protective plant cover and causes deterioration of the native plant community. Overgrazing also can result in severe soil losses by gully erosion. A planned grazing system that includes proper grazing use and timely deferment of grazing or haying help to keep the range in good condition.

In most areas these soils are unsuited to the trees and shrubs commonly grown as windbreaks. Because of the moderately steep and steep slope, trees can be planted by machine in only a few areas. Also, water erosion is a hazard. In selected areas used as wildlife habitat or as recreational areas, trees or shrubs that are tolerant of dry conditions and limy soils can be established if they are hand planted and if special practices are applied to overcome the slope and the erosion hazard.

Because of the slope, these soils are unsuitable as sites for sanitary facilities. A suitable alternative site should be selected.

The slope is a limitation if these soils are used as sites for buildings. The design of the buildings should accommodate the slope. Otherwise, grading is needed. The slope and low strength are limitations on sites for local roads. Cutting and filling generally are needed. Providing coarse grained subgrade or base material helps to overcome the low strength. A surface pavement that is thick enough to compensate for the low strength also is helpful. Measures that control erosion during and after construction are needed.

The capability unit is VIe-1 dryland; the Uly soil is assigned to Silty range site and the Coly soil to Limy Upland range site; both soils are assigned to windbreak suitability group 10.

UtG—Ustorthents, steep. These deep, somewhat excessively and excessively drained soils are on uplands and bottom land. They occur as areas where soil material was excavated and stockpiled during the

construction of the Tri-County and Phelps County irrigation canals. The areas run parallel to the canals and are long and narrow. They range from 5 to 40 acres in size.

The texture, color, and thickness of the layers of these soils vary from one area to another. In the uplands the surface layer commonly is pale brown silt loam about 2 inches thick. The underlying material to a depth of 60 inches is very pale brown silt loam. On the bottom land the upper 60 inches commonly is gravelly coarse sand mixed with loamy material.

Included with these soils in mapping are spots of Coly silt loam between some of the excavated areas. Also included are areas where the Ustorthents are moderately well drained and are less sloping. Included areas make up less than 5 percent of the unit.

Permeability is moderate in the uplands and rapid or very rapid on the bottom land. Runoff is medium or rapid in all areas. Available water capacity is moderate in the uplands and low or very low on the bottom land. Organic matter content is low in all areas.

Most areas of these soils support a sparse to good stand of grasses and weeds and are used as rangeland or as wildlife habitat. In most places the grasses have seeded naturally.

These soils are suitable as rangeland. A cover of range plants is effective in controlling water erosion and soil blowing. Overgrazing, however, reduces extent of the protective plant cover and causes deterioration of the natural vegetation. Proper grazing use and timely deferment of grazing help to keep the range in good condition.

These soils are suited to wildlife habitat. Most areas provide a nesting habitat for pheasants and bobwhite quail and some areas a nesting habitat for waterfowl. Deer use some areas as travel lanes between the Platte River and Johnson Lake. Small rodents and other mammals burrow for homes in some areas and use other areas for escape cover. Predators, such as coyotes, are attracted to the area by the rodents and game species. Proper grazing use enhances the habitat for all wildlife species.

These soils are unsuitable for cultivation because of the slope, the hazard of water erosion, and the inaccessibility to large machinery. Also, the soils on bottom land are too coarse textured and too droughty.

Mainly because of the slope, these soils are unsuited to the trees and shrubs commonly grown as windbreaks. In some of the areas used as wildlife habitat, trees and shrubs can be grown if they are hand planted and given special care.

These soils generally are unsuitable as sites for buildings, local roads, and sanitary facilities, mainly because of the slope. A suitable alternative site should be selected.

The capability unit is VIIs-8 dryland and the windbreak suitability group 10; no range site is assigned.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; for windbreaks; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

William E. Reinsch, conservation agronomist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

According to the Nebraska Agriculture Census, 50 percent of the farmland in Gosper County is planted to crops. The largest acreage is used for irrigated corn and dryland wheat, followed by dryland sorghum and alfalfa.

The potential of soils in Gosper County for increased production of food is good. About 164,630 acres is suitable as cropland. Of this total, 133,720 acres is suitable for irrigation if an adequate supply of water is available and 39,990 acres if water is available and erosion is controlled.

management for dryland crops

The management needed on soils used for dryland crops commonly includes measures that reduce the runoff rate, help to control erosion and soil blowing, conserve moisture, and improve tilth. Most of the soils in Gosper County are suitable for crops. In many areas, however, water erosion is a severe hazard and should be controlled by suitable conservation practices.

Terraces, contour farming, grassed waterways, and a conservation tillage system that keeps crop residue on the surface help to control water erosion. Keeping crop residue on the surface or growing a protective plant cover helps to prevent sealing and crusting of the soil during and after heavy rains. The moisture supply is increased in winter because the stubble catches drifting snow. Crop residue also stabilizes plant nutrients so that they cannot be leached or volatilized.

Soil blowing is a hazard on some of the soils, especially during periods when the amount of rainfall is below average. It can be controlled by a conservation tillage system that leaves crop residue on the surface, contour stripcropping, and field windbreaks. Planting row crops on the more productive soils and hay, pasture plants, or close-grown crops, such as small grain and alfalfa, on the steeper, more erosive soils helps to control both soil blowing and water erosion.

On some soils an insufficient amount of rainfall is the main limitation affecting dryland crops. A cropping

system that conserves moisture and controls water erosion and soil blowing is needed.

A cropping system is the sequence of crops grown on a field and the management needed to conserve soil and water. On soils used for dryland crops, it should preserve tilth and fertility, maintain a protective plant cover, and control weeds, insects, and diseases. The cropping system selected should be the one best suited to the soil. For example, grasses and legumes should be grown frequently on Coly silt loam, 6 to 9 percent slopes, eroded. On Holdrege silt loam, 0 to 1 percent slopes, however, row crops can be grown more frequently. The frequent row cropping does not significantly affect fertility and tilth.

Preparing a seedbed helps to control weeds and to provide a favorable growing medium for plants. If tillage is excessive, however, the granular structure in the surface layer breaks down and tilth deteriorates. Tillage should be kept at a minimum. Various methods of conservation tillage are used in Gosper County. Examples that are well suited to all of the commonly grown crops are a fallow system in which weeds are controlled by applications of herbicide rather than by tillage; till-plant, a system in which row crops are planted at the same time that the soil is tilled and tillage is restricted to the row; a system in which the soil is tilled with disks or chisels, which keep tillage at a minimum, and crop residue is on the surface when crops are planted; and stubble mulching, a system in which crop residue remains on the surface after the soil is tilled. Grass seeds can be drilled into a cover of stubble without further seedbed preparation.

Additional nutrients are needed in some of the soils used for dryland crops. The kinds and amounts of fertilizer to be applied should be based on the results of soil tests and on the content of moisture in the soil at the time of application. If the subsoil is dry and the amount of rainfall is low, the rate at which fertilizer is applied should be slightly lower than the rate needed when the soil is moist. On all soils used for nonlegume crops, nitrogen fertilizer is beneficial. Phosphorus and zinc are needed on the more eroded soils and in areas that are cut when terraces or diversions are constructed. The amount of fertilizer needed on soils used for dryland crops is smaller than the amount needed on soils used for irrigated crops because the plant population is lower.

On the soils assigned to the capability subclasses IIc, IIw, and IIIw, the best management includes a cover of crop residue, applications of fertilizer or barnyard manure, selection of suitable crop varieties, and a planned crop rotation. On the soils assigned to capability subclass IIe, it includes a cover of crop residue throughout the winter, contour farming, grassed waterways, and a conservation tillage system that leaves, per acre, about 2,000 pounds of corn or sorghum residue or 1,000 pounds of small grain residue on the surface after the crops are planted. On the soils assigned to capability subclasses IIIe and IVe, it includes a cover of crop residue throughout the winter, contour farming, terraces, grassed waterways, and a conservation tillage system that leaves, per acre, about 3,000 pounds of corn or sorghum residue or 1,500 pounds of small grain residue on the surface after the crops are planted. If the slope is more than 10 percent, grasses and legumes are needed in the cropping sequence to control water erosion. Also, a permanent plant cover commonly is needed.

In some areas Fillmore and Scott soils are subject to ponding. Unless the ponding can be controlled, the crops selected for planting should be those that can grow in a wet soil.

Applications of herbicide are effective in controlling weeds. The kind and amount applied, however, should be carefully controlled. The application rate should be determined by the colloidal clay and humus fraction of the soil, which is responsible for most of the chemical activity in the soil. Applications of an excessive amount of herbicide result in crop damage on sandy soils, which have a low content of colloidal clay, and on soils that have a moderately low or low content of organic matter. Establishing field boundaries on the contour results in a higher content of organic matter and thus helps to prevent the crop damage caused by herbicides.

management for irrigated crops

About 47 percent of the cropland in Gosper County is irrigated. Corn is grown on 76 percent of the irrigated cropland. A smaller acreage is used for alfalfa hay and sorghum. Corn, sorghum, and soybeans can be irrigated by a furrow or sprinkler method and alfalfa by a border, contour ditch, corrugation, or sprinkler method. The irrigation water is drawn from wells and irrigation canals.

The management needed in irrigated areas includes selection of a proper cropping sequence; land leveling, which results in an even distribution of irrigation water; measures that conserve moisture and control water erosion; and selection of a rate of water application that does not exceed the absorption rate of the soil.

The cropping sequence on soils that are well suited to irrigation is dominated by row crops. One that includes different row crops, small grain, and alfalfa or grass helps to control the diseases and insects that are common if the same crop is grown year after year.

A gently sloping soil, such as Holdrege silt loam, 3 to 6 percent slopes, is subject to water erosion in areas where it is irrigated by furrows that run downslope. Contour bench leveling or a combination of contour furrows and parallel terraces helps to control water erosion in these areas. In areas where a sprinkler system is used, terraces, contour farming, grassed waterways, and a conservation tillage system that keeps crop residue on the surface help to control water erosion. They also conserve water.

If an adequate amount of water is available, sprinklers are most effective on the coarser textured soils. They

can be used on the more sloping as well as the nearly level soils. They are either center-pivot sprinklers, which revolve around a central point, or are sets of sprinklers installed at various locations in the field. The water can be applied at a rate that does not exceed the absorption rate of the soil and thus result in excessive runoff. Because the water can be carefully controlled, sprinklers are effective in helping to establish new pastures on moderately steep soils. In summer, however, much of the water is lost through evaporation. Keeping crop residue on the surface increases the intake rate and decreases the evaporation rate. Wind drift can result in an uneven distribution of water in some areas.

Soil holds only a limited amount of water. The silt loams and silty clay loams in Gosper County, for example, hold about 2 inches of available water per foot of soil depth. Thus, a soil that is 4 feet deep and is planted to a crop that sends its roots to that depth can hold about 8 inches of water available for that crop. Irrigation should begin when about half of the available water has been used by the crop. Applying the water at regular intervals helps to keep the soil moist throughout at all times. The interval varies according to the crop and the time of year.

A tailwater recovery pit at the end of a field that is furrow irrigated helps to trap runoff of excess irrigation tailwater. This water can then be pumped to the upper ends of the field and used again. These pits increase the efficiency of the irrigation system and conserve the supply of underground water.

All of the soils in Nebraska are assigned to irrigation design groups, which are described in the Nebraska Irrigation Guide. The Arabic numerals shown in the designations of irrigation capability units at the end of the map unit descriptions under the heading "Detailed soil map units" indicate the irrigation design groups to which the soils are assigned.

Assistance in planning and designing an irrigation system is available through the local office of the Soil Conservation Service or the county agricultural agent. Estimates concerning cost of equipment can be obtained from dealers and manufacturers of irrigation equipment.

managing pasture and hayland

Areas that are used for hay or pasture should be managed for maximum production. A rotation grazing system that results in a uniform distribution of grazing is needed. Many forage plants are a good source of minerals, vitamins, protein, and other nutrients. A well managed pasture can provide a balanced ration throughout the growing season. Adding plant nutrients to the soil helps to obtain maximum production. The kinds and amounts of fertilizer needed should be determined by soil tests. If pastures are irrigated, a high level of management is needed.

A mixture of grasses and legumes can be grown in rotation with grain crops on many soils. The grasses and legumes improve tilth, increase the organic matter content, and help to control erosion. They are ideal as part of a conservation cropping system.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

prime farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It may be cropland, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for

producing food or fiber or is available for these uses. The soil qualities, growing season, and moisture supply are those needed for a well managed soil economically to produce a sustained high yield of crops. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at local offices of the Soil Conservation Service.

A recent trend in land use in some parts of Gosper County has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and difficult to cultivate and are less productive.

The map units in Gosper County that are considered prime farmland are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

About 159,950 acres, or nearly 53 percent of the total acreage, in Gosper County meets the requirements for prime farmland. The map units that meet these requirements are—

AnB—Anselmo fine sandy loam, 0 to 3 percent slopes
AnC—Anselmo fine sandy loam, 3 to 6 percent slopes
Cs—Cozad silt loam, 0 to 1 percent slopes
CsB—Cozad silt loam, 1 to 3 percent slopes
CsC—Cozad silt loam, 3 to 6 percent slopes
Fo—Fillmore silt loam, drained, 0 to 1 percent slopes
Go—Gosper loam, 0 to 2 percent slopes
Ha—Hall silt loam, 0 to 1 percent slopes
HaB—Hall silt loam, 1 to 3 percent slopes
Hd—Hobbs silt loam, 0 to 2 percent slopes
Ho—Holdrege silt loam, 0 to 1 percent slopes
HoB—Holdrege silt loam, 1 to 3 percent slopes
HoC—Holdrege silt loam, 3 to 6 percent slopes
HpB—Holdrege-Uly silt loams, 1 to 3 percent slopes
HpC2—Holdrege-Uly silt loams, 3 to 6 percent slopes, eroded
Hr—Hord silt loam, terrace, 0 to 1 percent slopes
HrB—Hord silt loam, terrace, 1 to 3 percent slopes
Hw—Hord silt loam, wet substratum, 0 to 2 percent slopes
Le—Lex loam, 0 to 2 percent slopes

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the

subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IVe-9 or IVe-8.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

rangeland

Peter N. Jensen, range conservationist, Soil Conservation Service, helped prepare this section.

About 47 percent of the farmland in Gosper County is rangeland. Raising livestock, mostly cow and calf herds, is the second largest farm enterprise in the county. The calves in the cow and calf herds are sold in the fall as feeders. The rangeland occurs as scattered areas throughout the county, mostly on the loess-covered hills and on the broken land along drainageways. The Uly-Coly and Coly-Uly-Hobbs associations, which are described under the heading "General soil map units," commonly are used as rangeland. The average size of ranches and livestock farms is about 1,200 acres.

The rangeland generally is grazed from late in spring to early in fall. The livestock graze corn or grain sorghum aftermath later in the fall and early in winter. They are fed alfalfa hay, native hay, or silage during the rest of the winter. Also, the native forage commonly is supplemented with protein concentrate.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 7 shows, for many soils in the survey area, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as or are suited to rangeland are listed. An explanation of the column headings in table 7 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre reduced to a common percent of air-dry moisture.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion and soil blowing. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Some of the rangeland in Gosper County has been depleted by overuse. The overgrazed areas support grasses, broad-leaved weeds, and other plants that provide a low amount of forage. Productivity can be increased by a planned grazing system that includes proper grazing use and timely deferment of grazing and by measures that control brush and weeds.

At the end of each map unit description under the heading "Detailed soil map units," most of the soils in the county are assigned to range sites. They are assigned to the Silty, Limy Upland, Silty Overflow, Thin Loess, Subirrigated, Saline Subirrigated, Sandy, Silty Lowland, and Clayey Overflow range sites. The interpretations for each of these range sites are given in the Technical Guide, which is available in local offices of the Soil Conservation Service. These offices also can provide ranchers and farmers with technical assistance in converting cropland to rangeland and in setting up a planned grazing system.

windbreaks and environmental plantings

Keith A. Ticknor, forester, Soil Conservation Service, helped prepare this section.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, keep snow from blowing off the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Most of the ranch headquarters and farmsteads in Gosper County are surrounded by trees, which were planted at various times since the headquarters were established. Also, many windbreaks have been planted to protect livestock.

In order for windbreaks to fulfill their intended purpose, the trees or shrubs selected should be suited to the soil on which they are planted. Selecting suitable species helps to obtain maximum survival and growth rates. Permeability, available water capacity, and fertility greatly affect the growth rate.

An insufficient amount of moisture in Gosper County restricts the survival rate. Proper site preparation prior to planting and control of weeds or other competing plants after planting are the major needs when a windbreak is established and managed. Drip irrigation also helps to overcome moisture deficiencies.

Many of the older windbreaks are deteriorating because they are crowded or because short-lived trees and shrubs have reached or passed maturity. Renovation is needed to restore the effectiveness of these windbreaks.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

At the end of each map unit description under the heading "Detailed soil map units," most of the soils in the county are assigned to a windbreak suitability group. Interpretations for each windbreak suitability group are given in the Technical Guide, which is available in local offices of the Soil Conservation Service.

recreation

Robert O. Koerner, biologist, Soil Conservation Service, helped prepare this section.

Part of the Johnson Lake State Recreation Area and three areas managed by the United States Department of the Interior, Fish and Wildlife Service, are the chief recreational areas in Gosper County.

About 20 acres in the Johnson Lake State Recreation Area is used for picnicking and 20 acres for camping. A swimming beach and a boat-launching area are also provided. Other recreational activities in this area are water skiing, fishing, waterfowl hunting, nature study, and hiking.

The three areas managed by the Fish and Wildlife Service are south of Bertrand. They occur as 866 acres of upland wildlife habitat and 585 acres of wetland wildlife habitat. They are open to the public for small game and waterfowl hunting during the regular hunting seasons. Other recreational activities in these areas are hiking, nature study, and photography.

Pheasants, bobwhite quail, and mourning dove are hunted throughout the county. Whitetail and mule deer are the only big game hunted in the county. Deer populations are maintained at peak tolerance levels by regulations that limit the number of permits. The best habitat for deer is along the Platte River, along other drainageways, and on the adjacent upland breaks.

Fish are caught in Johnson Lake, the Platte River, and the many farm ponds throughout the county. The main species are largemouth bass, bluegill, and catfish.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The

capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Robert O. Koerner, biologist, Soil Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and grain sorghum.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available

water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, smooth brome, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and blue grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, green ash, honeylocust, apple, hawthorn, dogwood, hickory, eastern cottonwood, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are sumac, autumn-olive, and wild plum.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, bitterbrush, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, prairie cordgrass, rushes, sedges, and reedgrass.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite, pheasant, meadowlark, field sparrow, cottontail, skunk, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodcock, thrushes, woodpeckers, squirrels, red fox, coyote, raccoon, deer, and opossum.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include deer, prairie grouse, meadowlark, and lark bunting.

The kinds of wildlife and wildlife habitat on the eight soil associations in Gosper County are described in the paragraphs that follow. The associations are described under the heading "General soil map units."

The Holdrege-Uly-Coly association provides a mixture of openland and rangeland wildlife habitat. It supports various types of plants, including small grain, corn, pasture and range plants, and, along drainageways, trees, shrubs, and vines. As a result, it provides habitat for a wide variety of wildlife, including pheasant, bobwhite, mourning dove, meadowlark, and other songbirds and skunk, deer, raccoon, badger, and many small rodents.

Water is available on this association from the many multipurpose ponds along the drainageways that lead to the Republican River (fig. 14). The wide bands of grass along these drainageways provide nesting cover. They also provide travel lanes for deer and other wildlife. Drainageways that have flat bottoms and steep sides provide excellent escape and nesting cover. They generally are not mowed because they are too steep. They are grazed by wildlife. The sides support tall, warm-season native grasses, such as big bluestem and indiangrass, and woody and herbaceous plants.

The sides of the roads on this association provide excellent nesting habitat. The native grasses and thickets of smooth sumac, native plum, buckbrush, and western snowberry along these roads provide escape cover for deer, pheasant, and bobwhite. The deer use the roadsides as travel lanes.

The Holdrege-Hall association provides habitat for openland wildlife. Mourning doves and upland game birds, such as pheasant and bobwhite, are the dominant wildlife species. Most of the acreage is cultivated. Wheat, corn, and alfalfa are grown. Irrigation systems provide water for wildlife during part of the year. Many areas are natural wetlands used by upland game birds and by local and migrating shore birds and waterfowl.

The Uly-Coly and the Coly-Uly-Hobbs associations provide habitat for openland and rangeland wildlife. They have deeply entrenched intermittent drainageways that support excellent herbaceous and woody cover. The main plants are buckbrush, native rose, and plum. Also,

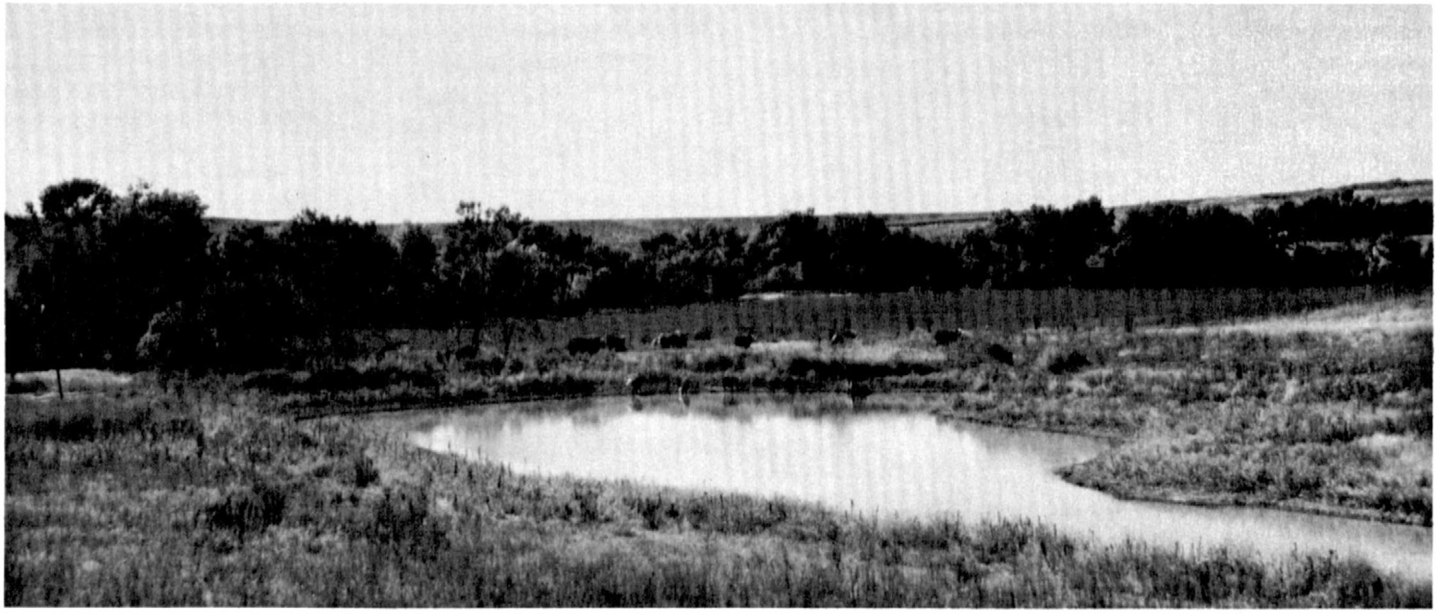

Figure 14.—Farm ponds and drainageways used as habitat for wildlife.

evident are hackberry, boxelder, elm, oak, and ash. Redcedar, buckbrush, and plum are on the bottoms of some of the drainageways. Some of the smoother slopes are mowed for hay. The steeper areas are used almost entirely as rangeland. Many species of wildlife inhabit these associations, including mule deer, coyote, fox, badger, skunk, raccoon, and a few whitetail deer.

The Hobbs-Cozad-Hord association provides habitat for woodland and openland wildlife (fig. 15). The wooded areas support boxelder, ash, elm, hackberry, and mulberry and an understory of plum, chokecherry, and buckbrush. The areas along streams provide escape cover and travel lanes for deer. They also provide habitat for mink, muskrat, and raccoon. Many songbirds nest in the trees, and many mourning doves inhabit the areas near streams.

The Cozad-Hord association provides habitat for openland wildlife. It is near the Platte River and in most areas is used for irrigated crops, mainly corn and alfalfa. Because of the readily available food, water, and cover along the Platte River, this association is inhabited by many kinds of wildlife.

The Anselmo association provides habitat for openland wildlife. It is near Johnson Lake and is commonly used for irrigated crops. Dominated by fine sandy loams, it has dispersed ground water to the south as far as Plum Creek. Here, some areas are marshy because the water has surfaced.

The Gosper-Lex association is on bottom land in the valley of the Platte River. It provides habitat for openland wildlife. The irrigated areas used for corn and alfalfa provide food, the wooded areas along the Platte River provide cover, and the river provides water. As a result of this diversity, a wide variety of wildlife inhabits this association.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Figure 15.—Deeply entrenched, spring-fed Muddy Creek in an area of the Hobbs-Cozad-Hord association. This area provides excellent wildlife habitat.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-

swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less

desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 or 20 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on

the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations generally can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

engineering index test data

Table 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series. The soil samples were tested by the Nebraska Department of Roads.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); and Particle density—T 100-75 I (AASHTO). The Nebraska Modified System was used to compute the group index number, which is part of the AASHTO classification.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*6*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (*Ust*, meaning intermittently dry, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplustolls (*Hapl*, meaning minimal horizonation, plus *ustolls*, the suborder of the Mollisols that have an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Haplustolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*5*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*6*). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Anselmo series

The Anselmo series consists of deep, well drained, moderately rapidly permeable soils on uplands and stream terraces. These soils formed in loamy material deposited and reworked by wind. Slopes range from 0 to 11 percent.

Anselmo soils are commonly adjacent to Coly, Cozad, Hall, Holdrege, and Uly soils. Coly, Cozad, and Uly soils are siltier throughout than the Anselmo soils. Coly and Uly soils are at the higher elevations on uplands, and Cozad soils are on stream terraces and foot slopes. Hall and Holdrege soils are lower on the landscape than the Anselmo soils. Also, their subsoil contains more clay.

Typical pedon of Anselmo fine sandy loam, 0 to 3 percent slopes, 520 feet west and 1,950 feet north of the southeast corner of sec. 16, T. 8 N., R. 22 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; slightly acid; clear smooth boundary.

A12—7 to 15 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, very friable; slightly acid; clear smooth boundary.

B2—15 to 26 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable; neutral; clear smooth boundary.

C1—26 to 50 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; single grained; loose; neutral; clear smooth boundary.

C2—50 to 60 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; neutral.

The thickness of the solum ranges from 11 to 26 inches and that of the mollic epipedon from 7 to 20 inches. The depth to free carbonates ranges from 26 to more than 60 inches.

The A horizon has value of 4 or 5 (2 or 3 moist). It is dominantly fine sandy loam but in some pedons is loam. It is neutral or slightly acid. The B2 horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It is dominantly fine sandy loam, but the range includes loam. The C horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 to 4. It is neutral or mildly alkaline.

Coly series

The Coly series consists of deep, well drained to excessively drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 6 to 60 percent.

Coly soils are commonly adjacent to Hobbs, Holdrege, and Uly soils. Hobbs soils are stratified, decrease irregularly in content of organic matter as the depth increases, and are deeper to carbonates than the Coly soils. They are on canyon bottoms. Holdrege soils are on the more gentle slopes or flats, generally higher on the landscape than the Coly soils. They are dark to a depth of more than 7 inches. They contain more clay in the control section than the Coly soils. Uly soils are on the smoother, longer slopes, commonly between high ridges and steep canyon breaks. They are deeper to accumulations of carbonate than the Coly soils, and their dark surface soil is thicker.

Typical pedon of Coly silt loam, in an area of Uly-Coly silt loams, 9 to 30 percent slopes (fig. 16), 1,795 feet east and 265 feet south of the northwest corner of sec. 15, T. 8 N., R. 22 W.

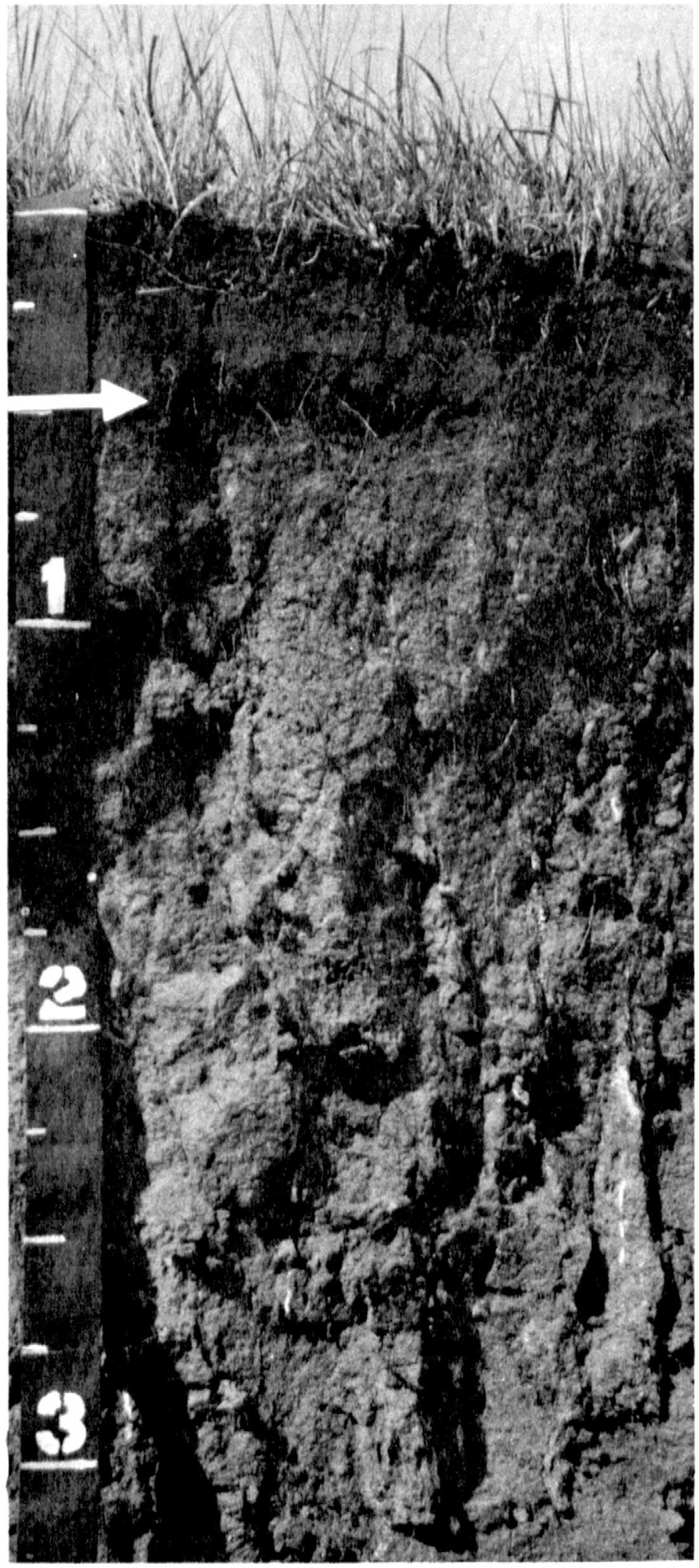

Figure 16.—Profile of Coly silt loam, in an area of Uly-Coly silt loams, 9 to 30 percent slopes. The surface layer is thin. Depth is marked in feet.

A1—0 to 5 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable; mildly alkaline; clear smooth boundary.

AC—5 to 7 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; slightly hard, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

C—7 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; common films and threads of calcium carbonate; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 3 to 10 inches. The dark colors of the A horizon extend to a depth of 3 to 6 inches. The depth to free carbonates ranges from 0 to 8 inches.

The A horizon has value of 5 to 7 (3 or 4 moist) and chroma of 2 or 3. The C horizon has value of 6 or 7 (4 to 6 moist) and chroma of 2 or 3.

Cozad series

The Cozad series consists of deep, well drained, moderately permeable soils on stream terraces and foot slopes, typically along streams or drainageways receiving recent sediments. These soils formed in colluvium on foot slopes and in silty alluvium on high stream terraces. Slopes range from 0 to 6 percent.

Cozad soils are commonly adjacent to Anselmo, Coly, Gosper, Hall, Hobbs, and Hord soils. Anselmo soils are less silty than the Cozad soils. They are on foot slopes or at the slightly higher elevations on stream terraces. Coly soils are more calcareous and more steep than the Cozad soils. They are on foot slopes and breaks of adjacent uplands. Gosper soils are on bottom land. They are underlain by mixed sand and gravel at a depth of 40 to 60 inches. Hall and Hord soils are dark to a depth of more than 20 inches. They are lower on the landscape than the Cozad soils. Hobbs soils contain more clay in the upper 40 inches than the Cozad soils. They are stratified in the upper 10 inches and do not have a mollic epipedon.

Typical pedon of Cozad silt loam, 0 to 1 percent slopes, 100 feet east and 30 feet north of the southwest corner of sec. 3, T. 8 N., R. 21 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A12—7 to 13 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to moderate medium granular; slightly hard, friable; neutral; clear smooth boundary.

B2—13 to 19 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist: weak fine subangular blocky structure; slightly hard, friable; neutral; gradual wavy boundary.

C1—19 to 23 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; massive; slightly hard, very friable; mildly alkaline; clear smooth boundary.

C2—23 to 33 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable; mildly alkaline; clear smooth boundary.

C3—33 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; mildly alkaline; slight effervescence.

The thickness of the solum ranges from 15 to 26 inches, and the depth to free carbonates ranges from 10 to 36 inches. The thickness of the mollic epipedon ranges from 9 to 16 inches.

The A horizon has value of 4 or 5 (2 or 3 moist). It is dominantly silt loam, but the range includes loam. The B horizon has value of 5 or 6 (3 or 4 moist). The C horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3.

Fillmore series

The Fillmore series consists of deep, very slowly permeable soils that have a claypan subsoil. These soils are in basinlike depressions on uplands and stream terraces. They formed in loess on the uplands or in a mixture of loess and alluvium on the stream terraces. They generally are poorly drained, but the drained phase is somewhat poorly drained. Slopes are 0 to 1 percent.

Fillmore soils are in the same family as Scott soils and are commonly adjacent to Hall, Holdrege, Hord, and Scott soils. Hall, Holdrege, and Hord soils are well drained. Their subsoil is less clayey than that of the Fillmore soils. Scott soils are very poorly drained and are in the deeper depressions, which are ponded for long periods. Their surface soil is thinner than that of the Fillmore soils.

Typical pedon of Fillmore silt loam, 0 to 1 percent slopes, 2,300 feet north and 1,000 feet east of the southwest corner of sec. 15, T. 7 N., R. 21 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate medium granular structure; hard, friable; slightly acid; abrupt smooth boundary.

A12—7 to 12 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate medium and fine granular structure; hard, friable; slightly acid; clear smooth boundary.

A2—12 to 17 inches; gray (10YR 5/1) silt loam, dark gray (10YR 4/1) moist; weak fine platy structure parting to weak fine granular; slightly hard, very friable; slightly acid; abrupt smooth boundary.

B21t—17 to 26 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; strong medium

subangular blocky structure; hard, firm; neutral; clear smooth boundary.

B22t—26 to 34 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; strong medium angular blocky structure; very hard, very firm; shiny faces on most peds; mildly alkaline; clear smooth boundary.

B3—34 to 39 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, firm; mildly alkaline; clear smooth boundary.

C—39 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 30 to 50 inches. The A horizon ranges from 8 to 17 inches in thickness. The A2 horizon is 5 to 9 inches thick. The mollic epipedon commonly extends into the upper part of the B2t horizon and in a few pedons extends through the solum. The depth to free carbonates ranges from 30 to more than 60 inches.

The Ap or A1 horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is dominantly silt loam, but the range includes silty clay loam. The A2 horizon has value of 5 or 6 (4 or 5 moist). The B2t horizon has value of 4 or 5 (2 to 4 moist) and chroma of 1 or 2. The darker colors are in the upper part. This horizon averages as low as 45 percent clay in some pedons and as high as 55 percent clay in others. The C horizon has value of 5 or 6 (4 or 5 moist).

Gosper series

The Gosper series consists of deep, moderately well drained soils that are moderately permeable in the upper part and more rapidly permeable in the underlying material. These soils formed in loamy or sandy alluvium on low stream terraces. Slopes range from 0 to 2 percent.

Gosper soils are commonly adjacent to Cozad, Hord, Lex, and Platte soils. The well drained Cozad and Hord soils are at the slightly higher elevations on stream terraces. They are more than 60 inches deep to sand and gravel. The somewhat poorly drained Lex and Platte soils are at the lower elevations on bottom land. They are commonly more alkaline than the Gosper soils. The Lex soils are less than 40 inches deep to sand and gravel and the Platte soils less than 20 inches.

Typical pedon of Gosper loam, 0 to 2 percent slopes, 20 feet west and 1,650 feet south of the northeast corner of sec. 5, T. 8 N., R. 21 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; weak medium and fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A12—7 to 12 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; moderate medium and fine granular structure; slightly hard, very friable; neutral; clear smooth boundary.

B21t—12 to 18 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; moderate medium and fine subangular blocky structure; hard, firm; shiny faces on a few peds; mildly alkaline; gradual wavy boundary.

B22t—18 to 24 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak medium and fine subangular blocky structure; hard, firm; shiny faces on a few peds; mildly alkaline; gradual wavy boundary.

C1—24 to 40 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak medium granular structure; slightly hard, friable; slight effervescence; moderately alkaline; gradual wavy boundary.

C2—40 to 52 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; threads, soft accumulations, and some concretions of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

C3—52 to 60 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; single grained; loose; threads, rounded accumulations, and a few concretions of carbonate; clean pale brown fine and medium sand at a depth of 60 inches; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 36 inches, and the depth to carbonates ranges from 10 to 24 inches. The thickness of the mollic epipedon ranges from 14 to 20 inches. Some pedons have a buried horizon below a depth of 20 inches. This horizon has value of 3, but it is not part of the mollic epipedon because the content of organic carbon is less than 0.58 percent.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is typically loam but is silt loam in some pedons. It ranges from neutral to moderately alkaline. The B horizon has value of 3 to 6 (2 to 4 moist) and chroma of 2 or 3. It is mildly alkaline or moderately alkaline. The lower part of the B horizon and the upper part of the C horizon are slightly affected by soluble salts in some pedons. The C horizon has hue of 2.5Y or 10YR, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. In some pedons it is mottled with reddish brown or gray. The upper part of the C horizon is fine sandy loam, loam, or sandy loam. The lower part is loamy sand or sand. The depth to loamy sand or sand ranges from 42 to 60 inches.

Gothenburg series

The Gothenburg series consists of poorly drained or somewhat poorly drained soils that are very shallow over sand and gravel. Permeability is moderately rapid in the

surface soil and very rapid in the underlying material. These soils formed in recent alluvium on bottom land. Slopes range from 0 to 2 percent.

Gothenburg soils are slightly lower on the landscape than the adjacent Lex and Platte soils. The adjacent soils are deeper to sand and gravel than the Gothenburg soils.

Typical pedon of Gothenburg fine sandy loam, 0 to 2 percent slopes, 2,900 feet north and 2,000 feet east of the southwest corner of sec. 2, T. 8 N., R. 21 W.

A1—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; slight effervescence; neutral; clear smooth boundary.

IIC—5 to 60 inches; light gray (10YR 7/2) gravelly sand, grayish brown (10YR 5/2) moist; common fine and medium distinct yellowish brown (10YR 5/6 moist) mottles; single grained; loose; neutral; many coarse pebbles, 36 percent by volume.

The A horizon ranges from 1 to 5 inches in thickness. It has value of 4 or 5 (2 or 3 moist). It is dominantly fine sandy loam but is loam, sandy loam, or loamy sand in some pedons. The IIC horizon is coarse sand or gravelly sand.

Hall series

The Hall series consists of deep, well drained, moderately permeable soils formed in silty loess on uplands. Slopes range from 0 to 3 percent.

Hall soils are adjacent to Fillmore, Hobbs, Holdrege, and Hord soils. Fillmore soils are poorly drained. Hobbs soils are in swales or broad drainageways and are occasionally flooded. Holdrege soils are dark to a depth of less than 20 inches. They commonly are slightly higher on the landscape than the Hall soils. Hord soils do not have an argillic horizon. They are on stream terraces.

Typical pedon of Hall silt loam, 0 to 1 percent slopes, 30 feet north and 210 feet west of the southeast corner of sec. 2, T. 7 N., R. 22 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A12—8 to 14 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, friable; neutral; clear smooth boundary.

B21t—14 to 22 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable; neutral; clear smooth boundary.

B22t—22 to 30 inches; grayish brown (10YR 5/2) silty clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable; mildly alkaline; gradual wavy boundary.

B3—30 to 40 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; hard, friable; mildly alkaline; clear smooth boundary.

C1—40 to 50 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure; hard, friable; slight effervescence; moderately alkaline; clear smooth boundary.

C2—50 to 60 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; few soft accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 32 to 40 inches, and the depth to free carbonates ranges from 36 to 50 inches. The thickness of the mollic epipedon ranges from 20 to 38 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The B2t horizon has value of 4 to 6 (2 to 4 moist). The darker colors are in the upper part. This horizon averages as low as 28 percent clay in some pedons and as high as 35 percent clay in others. It is neutral or mildly alkaline. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 or 3. It is mildly alkaline or moderately alkaline.

Hobbs series

The Hobbs series consists of deep, well drained, moderately permeable soils on flood plains and on the foot slopes of small drainageways. These soils formed in silty alluvial material derived mostly from loess-mantled uplands. Slopes range from 0 to 3 percent.

Hobbs soils are commonly adjacent to Coly, Cozad, Hall, Holdrege, Hord, and Uly soils. Coly and Uly soils are on uplands. Coly soils commonly have free carbonates near the surface. Their dark surface layer is thinner than that of the Hobbs soils. Uly soils are not stratified. Cozad soils contain less clay in the control section than the Hobbs soils. Also, they are slightly higher on the landscape. Hall and Holdrege soils have an argillic horizon. They are higher on the landscape than the Hobbs soils. Hord soils are not stratified. They are slightly higher on the landscape than the Hobbs soils. Also, their dark surface soil is thicker.

Typical pedon of Hobbs silt loam, 0 to 2 percent slopes (fig. 17), 900 feet west and 1,800 feet north of the southeast corner of sec. 2, T. 7 N., R. 23 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate

medium subangular blocky structure; slightly hard, very friable; neutral; clear smooth boundary.

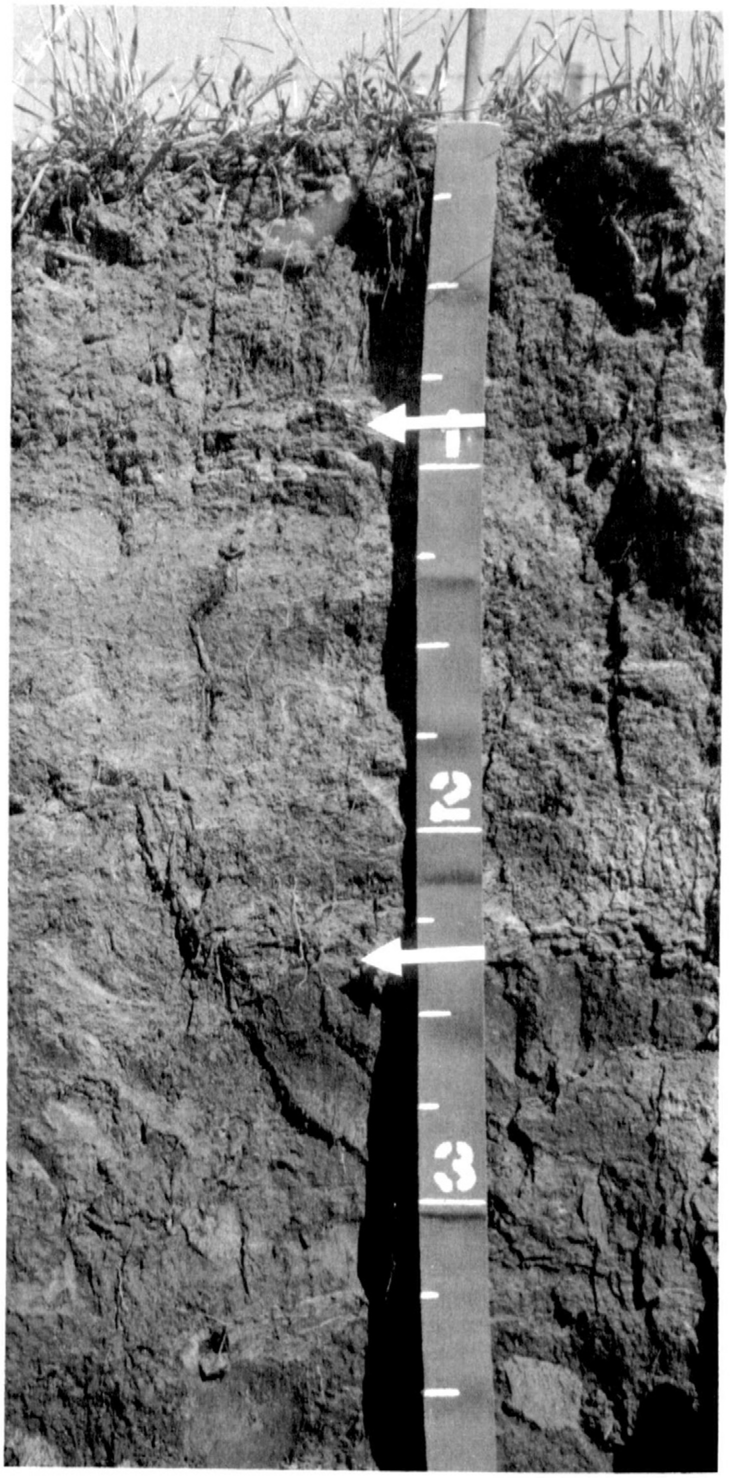

Figure 17.—Profile of Hobbs silt loam, 0 to 2 percent slopes. The stratified layers are caused by flooding. Depth is marked in feet.

C1—8 to 22 inches; stratified grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; weak medium granular structure; slightly hard, friable; common bedding planes; mildly alkaline; abrupt smooth boundary.

C2—22 to 34 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable; common bedding planes; mildly alkaline; clear smooth boundary.

C3—34 to 40 inches; light gray (10YR 7/2) silt loam, dark grayish brown (10YR 4/2) moist; grayish brown (10YR 5/2) material in worm casts and old root channels; massive; common bedding planes; slightly hard, friable; mildly alkaline; gradual smooth boundary.

C4—40 to 60 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; massive; slight effervescence; mildly alkaline.

Mollic colors extend to a depth of 22 to more than 60 inches, and the content of organic matter decreases very irregularly as depth increases. Stratification of color and texture is common throughout the pedon. The A horizon ranges from 6 to 9 inches in thickness. It has value of 4 or 5 (2 or 3 moist). It is neutral or mildly alkaline. The C horizon generally has value of 4 to 7 (3 to 6 moist) and chroma of 1 to 3, but in some strata the value is higher or lower. This horizon is neutral or mildly alkaline. Fine strata of sandy or clayey material are in some pedons.

The Hobbs soil that occurs as part of the map unit Coly-Hobbs silt loams, 2 to 60 percent slopes, is a taxadjunct to the Hobbs series because it is calcareous throughout and does not have a dark A horizon. These differences, however, do not significantly affect the use or behavior of the soil.

Holdrege series

The Holdrege series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in silty, calcareous loess. Slopes range from 0 to 6 percent.

Holdrege soils are commonly adjacent to Coly, Fillmore, Hall, Scott, and Uly soils. Coly and Uly soils do not have an argillic horizon. They are strongly sloping to steep or very steep. Also, Coly soils have carbonates at or near the surface. Fillmore and Scott soils are in shallow, closed depressions. Their B2t horizon is finer textured than that of the Holdrege soils. Hall soils have a mollic epipedon that is more than 20 inches thick. They are commonly at the slightly lower elevations on the landscape.

Typical pedon of Holdrege silt loam, 1 to 3 percent slopes (fig. 18), 400 feet south and 2,100 feet east of the northwest corner of sec. 15, T. 6 N., R. 23 W.

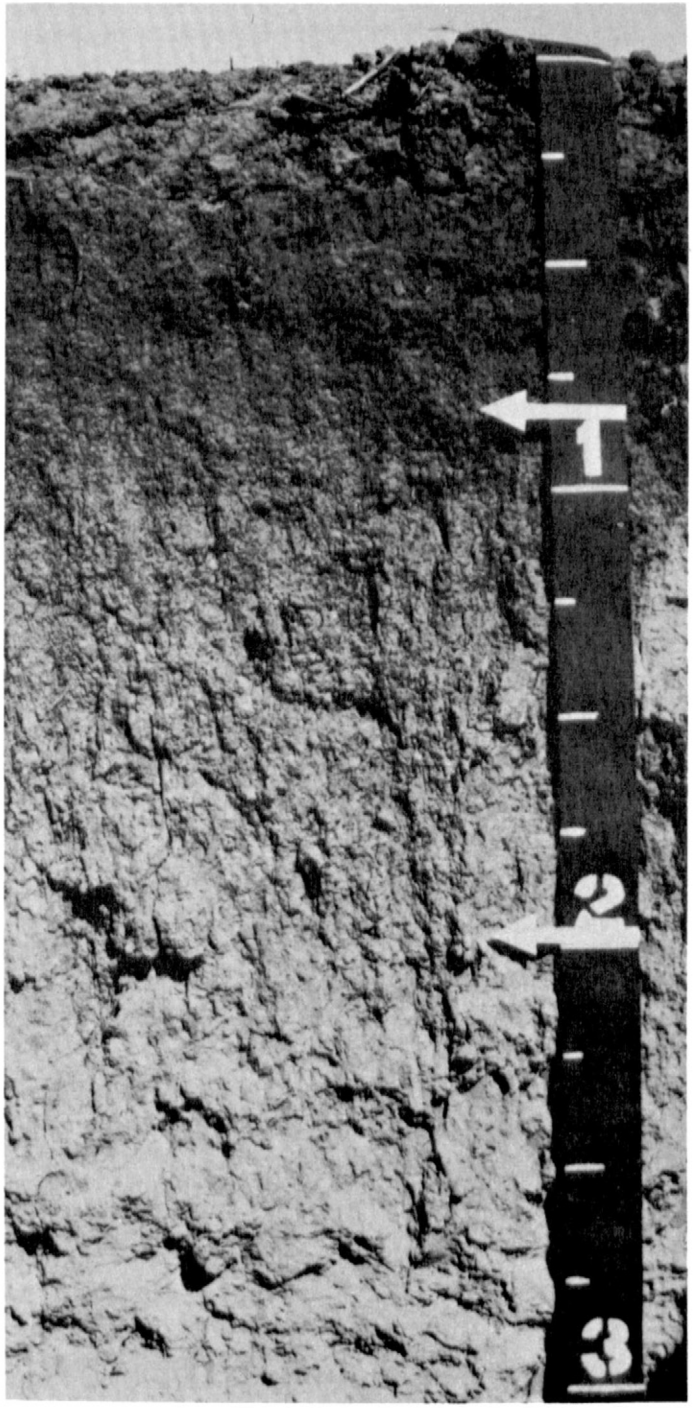

Figure 18.—Profile of Holdrege silt loam, 1 to 3 percent slopes. The surface layer is dark. Depth is marked in feet.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A12—6 to 12 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable; neutral; clear smooth boundary.

B21t—12 to 16 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; hard, firm, sticky; neutral; clear smooth boundary.

B22t—16 to 20 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm; neutral; clear smooth boundary.

B3—20 to 23 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; few soft accumulations of carbonate; slight effervescence; moderately alkaline; gradual smooth boundary.

C1—23 to 33 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; weak medium and fine subangular blocky structure; soft, very friable; few soft white accumulations of carbonate; strong effervescence; moderately alkaline; gradual smooth boundary.

C2—33 to 60 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; few soft white accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 32 inches, and the depth to free carbonates ranges from 20 to 36 inches. The mollic epipedon ranges from 8 to 18 inches in thickness and commonly includes the upper part of the B2t horizon.

The A horizon has value of 4 or 5 (2 or 3 moist). It is dominantly silt loam, but the range includes silty clay loam. The B2t horizon has value of 4 to 6 (3 to 5 moist) and chroma of 2 or 3. The darker colors are common in the upper part. This horizon averages as low as 28 percent clay in some pedons and as high as 35 percent clay in others. It is neutral or mildly alkaline. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 or 3.

The Holdrege soil that occurs as part of the map unit Holdrege-Uly silt loams, 3 to 6 percent slopes, eroded, is more shallow to carbonates than is defined as the range for the Holdrege series and has a solum that is less than 20 inches thick. These differences, however, do not significantly affect the use or behavior of the soil.

Hord series

The Hord series consists of deep, moderately permeable soils formed in a mixture of silty colluvium

and alluvium on stream terraces. These soils generally are well drained, but the wet substratum phase is somewhat poorly drained. Slopes range from 0 to 3 percent.

Hord soils are adjacent to Anselmo, Coly, Cozad, Hall, and Hobbs soils. Anselmo soils are coarse-loamy. They are on slight ridges on stream terraces. Coly soils do not have dark surface soil and are more calcareous than the Hord soils. They are on side slopes along the major creeks. Cozad soils are dark to a depth of less than 20 inches and are stratified. They are commonly slightly higher on the landscape than the Hord soils. Hall soils have an argillic horizon. They are in positions on the landscape similar to those of the Hord soils. Hobbs soils are stratified and are in occasionally flooded drainageways.

Typical pedon of Hord silt loam, terrace, 0 to 1 percent slopes, 100 feet south and 2,630 feet east of the northwest corner of sec. 5, T. 8 N., R. 21 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

A12—7 to 14 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, friable; neutral; clear smooth boundary.

B2—14 to 24 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

B3—24 to 30 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, very friable; slight effervescence; mildly alkaline; clear wavy boundary.

C1—30 to 50 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; violent effervescence; moderately alkaline; clear smooth boundary.

C2—50 to 60 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 24 to 33 inches. The thickness of the mollic epipedon ranges from 20 to 30 inches. The depth to free carbonates ranges from 24 to 46 inches.

The A horizon has value of 4 or 5 (2 moist) and chroma of 1 or 2. It is dominantly silt loam but is very fine sandy loam in some pedons. It is slightly acid or neutral. The B2 horizon has value of 4 or 5 (2 or 3 moist). The darker colors are in the upper part. This horizon is neutral or mildly alkaline. In the C horizon stratification of color and texture is common. This horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. It is dominantly silt loam, but the range includes very fine sandy loam and silty clay loam. This horizon is mildly alkaline or moderately alkaline.

Lex series

The Lex series consists of somewhat poorly drained soils that are moderately deep over sand and gravel. Permeability is moderate or moderately slow in the upper part of the profile and very rapid in the underlying sand and gravel. These soils formed in recent alluvium on bottom land. Slopes range from 0 to 2 percent.

Lex soils are adjacent to Gosper and Platte soils. The moderately well drained Gosper soils are at the slightly higher elevations on bottom land. They are deep over sand and gravelly sand. Platte soils are at the slightly lower elevations. They are less than 20 inches deep to sand, gravelly sand, or gravel.

Typical pedon of Lex loam, 0 to 2 percent slopes, 1,480 feet south and 800 feet west of the northeast corner of sec. 4, T. 8 N., R. 21 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

A12—7 to 12 inches; gray (10YR 5/1) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure; hard, friable; strong effervescence; moderately alkaline; clear smooth boundary.

A13—12 to 20 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; hard, friable; violent effervescence; strongly alkaline; clear smooth boundary.

A14—20 to 24 inches; dark grayish brown (10YR 4/2) loam, very dark gray (10YR 3/1) moist; common medium distinct light gray (10YR 7/1) and few medium faint very dark grayish brown (10YR 3/2) mottles; moderate medium subangular blocky structure; hard, friable; strong effervescence; strongly alkaline; clear smooth boundary.

C1—24 to 29 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; common medium faint grayish brown (10YR 5/2) mottles; massive; slightly hard, very friable; slight effervescence; strongly alkaline; abrupt smooth boundary.

IIC2—29 to 36 inches; light gray (2.5Y 7/2) fine sand, grayish brown (2.5Y 5/2) moist; single grained; loose; moderately alkaline; abrupt smooth boundary.

IIC3—36 to 50 inches; very pale brown (10YR 7/3) gravelly sand, grayish brown (10YR 5/2) moist; single grained; loose; mildly alkaline; gradual smooth boundary.

IIC4—50 to 60 inches; light gray (10YR 7/2) gravelly sand, brown (7.5YR 5/4) moist; many medium distinct reddish brown (5YR 5/4) mottles; single grained; neutral.

The thickness of the solum ranges from 18 to 24 inches. The mollic epipedon is 18 to 20 inches thick. The depth to sand or gravelly sand ranges from 24 to 30 inches. The soils typically are calcareous at the surface.

The A horizon is loam, silt loam, clay loam, or silty clay loam. It is mildly alkaline to strongly alkaline. It has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. Many of the mottles in the lower part of this horizon have value of 6 or 7 (4 or 5 moist). The C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 or 3. It has common mottles with value of 5 or 6 moist and chroma of 2 moist. It is loam, fine sandy loam, or sandy loam. It is calcareous and is moderately alkaline or strongly alkaline. The IIC horizon is stratified fine sand to gravelly sand.

Platte series

The Platte series consists of somewhat poorly drained soils that are shallow over sand or sand and gravel. Permeability is moderate in the upper part of the profile and very rapid in the underlying sand and gravel. These soils formed in recent alluvium on bottom land. Slopes range from 0 to 2 percent.

Platte soils are commonly adjacent to Gothenburg and Lex soils. Gothenburg soils are very shallow over sand and mixed sand and gravel. They are lower in elevation than the Platte soils, are closer to streams, and are frequently flooded. Lex soils commonly are slightly higher on the landscape than the Platte soils. They are moderately deep over sand or mixed sand and gravel.

Typical pedon of Platte loam, 0 to 2 percent slopes, 840 feet north and 550 feet west of the southeast corner of sec. 2, T. 8 N., R. 21 W.

A1—0 to 5 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak medium and fine granular structure; slightly hard, very friable; strong effervescence; mildly alkaline; abrupt smooth boundary.

C1—5 to 12 inches; light gray (2.5Y 7/2) finely stratified fine sandy loam, grayish brown (2.5Y 5/2) moist; few fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; slightly hard, very friable; violent effervescence; mildly alkaline; clear smooth boundary.

IIC2—12 to 20 inches; light gray (10YR 7/2) coarse sand, brown (10YR 4/3) moist; single grained; loose; mildly alkaline; clear smooth boundary.

IIC3—20 to 60 inches; light gray (10YR 7/2) gravelly coarse sand, brown (10YR 4/3) moist; single grained; loose; neutral.

The depth to coarse sand or mixed sand and gravel ranges from 12 to 20 inches. The A horizon is 5 to 7 inches thick. It has value of 4 or 5 (2 or 3 moist). It is typically loam, but the range includes fine sandy loam. The C horizon has hue of 2.5Y or 10YR, value of 6 or 7 (4 or 5 moist), and chorma of 2. It is typically fine sandy loam, but the range includes loamy very fine sand. The A and C horizons are dominantly calcareous and are mildly alkaline or moderately alkaline. The IIC horizon is commonly stratified coarse sand and gravelly coarse sand.

Scott series

The Scott series consists of deep, very poorly drained, very slowly permeable soils that formed in loess in depressions on uplands. Slopes are 0 to 1 percent.

Scott soils are in the same family as Fillmore soils and are commonly adjacent to Fillmore, Hall, and Holdrege soils. Fillmore soils are in shallow depressions or in the shallower parts of depressions and are ponded for shorter periods than the Scott soils. Also, their A horizon is thicker. The well drained Hall and Holdrege soils are on uplands. They do not have an A2 horizon. Their B2t horizon contains less clay than that of the Scott soils.

Typical pedon of Scott silty clay loam, 0 to 1 percent slopes, 2,100 feet north and 100 feet east of the southwest corner of sec. 13, T. 6 N., R. 21 W.

A11—0 to 3 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium granular structure; hard, friable; neutral; abrupt smooth boundary.

A2—3 to 6 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak fine platy structure parting to weak medium and fine granular; hard, friable; slightly acid; abrupt smooth boundary.

B21t—6 to 18 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate medium and fine angular blocky; very hard, firm; shiny faces on some peds; the tops of peds coated with A2 material; neutral; clear smooth boundary.

B22t—18 to 27 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; very hard, firm; neutral; clear smooth boundary.

B3—27 to 36 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, friable; mildly alkaline; gradual wavy boundary.

C—36 to 60 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; mildly alkaline.

The thickness of the solum ranges from 27 to 44 inches. Free carbonates are dominantly below a depth of 60 inches, but in some pedons they are at a depth of 35 to 40 inches. Most pedons do not have an albic horizon because of the mixing that occurs when the soils are tilled. Cracks 2 to 3 inches wide and as much as 15 to 20 inches deep form when the soils dry out.

The A1 horizon has value of 4 or 5 (2 moist) and chroma of 1 or 2. It is silt loam or silty clay loam. It is

slightly acid or neutral. The A2 horizon has value of 5 (3 or 4 moist). The B2t horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is neutral or mildly alkaline. The B3 horizon has value of 4 or 5 (3 or 4 moist). The C horizon has value of 6 or 7 (4 or 5 moist) and chroma of 2 or 3. It is mildly alkaline or moderately alkaline.

Uly series

The Uly series consists of deep, well drained and somewhat excessively drained, moderately permeable soils on uplands. These soils formed in silty, calcareous loess. Slopes range from 6 to 30 percent.

Uly soils are commonly adjacent to Coly, Hall, Hobbs, and Holdrege soils. Coly soils are on the steeper slopes or narrow ridgetops. They do not have a mollic epipedon or a B horizon. The nearly level to gently sloping Hall and Holdrege soils have an argillic horizon. Hobbs soils are stratified. They are on occasionally flooded colluvial slopes or the bottoms of upland drainageways.

Typical pedon of Uly silt loam, in an area of Uly-Coly silt loams, 9 to 30 percent slopes (fig. 19), 25 feet east and 2,700 feet north of the southwest corner of sec. 18, T. 6 N., R. 22 W.

A1—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable; neutral; clear smooth boundary.

B2—7 to 11 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; slightly hard, very friable; neutral; clear smooth boundary.

B3—11 to 15 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable; strong effervescence; mildly alkaline; clear wavy boundary.

C1—15 to 30 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; weak fine subangular blocky structure; slightly hard, very friable; threads and coatings of carbonate on peds; violent effervescence; moderately alkaline; clear wavy boundary.

C2—30 to 60 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; few soft white accumulations of carbonate; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 15 to 24 inches. The thickness of the mollic epipedon ranges from 8 to 16 inches. The depth to free carbonates ranges from 12 to 24 inches.

The A horizon has value of 4 or 5 (2 or 3 moist). It is neutral or mildly alkaline. The B horizon has value of 4 to 6 (2 to 5 moist). In the upper part it commonly has mollic colors. It is neutral or mildly alkaline. The C horizon has

Figure 19.—Profile of Uly silt loam, in an area of Uly-Coly silt loams, 9 to 30 percent slopes. The subsoil has subangular blocky structure. Depth is marked in feet.

hue of 10YR or 2.5Y, value of 6 or 7 (5 moist), and chroma of 2.

The Uly soil that occurs as part of the map unit Holdrege-Uly silt loams, 3 to 6 percent slopes, eroded, has a solum that is thinner than is defined as the range for the Uly series and does not have a mollic epipedon. These differences, however, do not significantly affect the use or behavior of the soil.

formation of the soils

Soil forms when soil-forming processes act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, and (5) the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. Some time is always required for differentiation of soil horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four.

parent material

Parent material is the unconsolidated mineral material in which a soil forms. It determines the chemical and mineralogical composition of the soil. The soils in Gosper County formed in loess, loamy eolian material, colluvium, and alluvium.

Loess, or wind deposited silt, is the parent material of the soils throughout all parts of the county except for the valleys of the Platte River and of other streams. It is dominantly Peoria loess, a friable, massive, light gray silt loam that is calcareous and has a few lime concretions. This loess ranges from a few to more than 100 feet in thickness. Holdrege, Uly, Coly, and the lower part of Hall soils formed in this material.

Bignell loess is in some areas in the northern part of the county. It is several feet thick near the valley of the Platte River but thins out in the areas to the south. It also is light gray silt loam, but it has a higher content of very fine sand than Peoria loess.

The Loveland Formation is reddish brown, silty material that is assumed to be of loessial origin. It underlies the Peoria loess. In Gosper County it is exposed on road cuts or along the base of canyon walls in the map units Uly-Coly silt loams, 9 to 30 percent slopes, and Coly-Hobbs silt loams, 2 to 60 percent slopes. It is exposed more extensively in the areas where canyons extend southward on the Republican River watershed.

Loamy eolian material mantles part of the Johnson Lake area. It is loose fine sandy loam. It is a few feet to several feet thick over the underlying loess. The soils that formed in this material are moderately low in content of organic matter and in natural fertility. Anselmo soils are an example.

Colluvium is soil material that accumulates in downslope areas as a result of the combined forces of gravity and water. The Cozad silt loam on foot slopes at the base of loess-mantled hills along the larger drainageways formed in this material.

Alluvium is a heterogeneous mixture of soil material deposited by water. It is on flood plains along streams. In all areas but the valley of the Platte River, it washed in from the loess-mantled uplands. The Hobbs, Cozad, and Hord soils on stream terraces formed in this material. The alluvium along the Platte River contains sand and gravel from outside the area. Lex, Platte, and Gothenburg soils formed in this material.

climate

Climate affects the formation of soils both directly and indirectly. It affects soil formation indirectly through its effect on the amount and kind of vegetation and animal life on and in the soil. Rainfall, temperature, and wind directly affect soil formation by weathering or reworking the parent material.

The average annual precipitation in Gosper County is about 22 inches. Enough moisture moves through the soil to leach free lime from the surface layer to the subsoil and in some soils to the upper part of the underlying material. In a few soils the moisture has also moved clay particles from the surface layer into the subsoil. In depressional areas ponding has so increased the rate of water movement into and through the soil that a claypan subsoil has formed. In areas where slopes are steep, water erosion has prevented the formation of a thick surface layer. Soils in low lying areas on bottom land are affected by floodwater, which deposits sediments during periods of snowmelt and heavy rainfall.

Temperature affects soil formation. Hot weather in combination with abundant soil moisture, for example, speeds chemical weathering. Alternating periods of freezing and thawing and of wetting and drying aid in the development of granular structure in the surface layer.

Northwest winds have influenced the distribution of loess and other eolian material. Because of these northwest winds, snow accumulates on the slopes facing southeast. The resulting additional moisture causes deeper leaching and increases the extent of the plant cover. The more extensive plant cover results in a higher content of organic matter in the soil. Soil blowing results in a thin surface layer.

plants and animals

Prairie grasses provide the organic matter that has accumulated in the soils of Gosper County. This organic matter darkened the surface layer and the upper part of the subsoil. The largest amount of organic matter is generally near the surface. The amount generally decreases gradually with increasing depth. Holdrege soils, for example, typically are dark grayish brown in the upper 16 inches, where the content of organic matter is highest. Because the content of organic matter is lower, the lower part of the subsoil is grayish brown and light brownish gray and the underlying material is light gray.

Fillmore soils commonly are higher in content of organic matter than Holdrege soils. Because they are in depressions, they receive additional moisture, which helps to produce more of the tall grasses and thus more organic matter. The organic-rich layers in these soils are thicker and darker than those in soils on uplands where water runs off the surface more rapidly.

Animals help to mix the organic-rich layers with the underlying mineral-rich material. Burrows filled with soil material of a contrasting color are evidence of animal activity in the soil. Worms and burrowing insects mix the soil material, improve granulation, and increase the availability of plant nutrients. Micro-organisms increase the content of plant nutrients by helping to decompose organic matter. Bacteria use nitrogen gas from the atmosphere and transform ammonium nitrogen into nitrate nitrogen.

Human activities have a major effect on soil formation. Because of cropping sequences, drainage systems, irrigation, and summer fallow, the relationships among soil, water, and erosion that existed for several thousand years have changed. Removing the grass cover has exposed the fertile surface layer to erosion. Drainage systems have increased chemical activity and weathering in poorly drained soils. Irrigation and summer fallow have increased the moisture supply and thus the rates of chemical weathering and water movement.

relief

Relief is an important factor in the formation of soils in Gosper County. The steepness, shape, length, and direction of slopes affect the runoff rate, erosion, and the amount of moisture available for soil formation. The moderately steep and steep Coly soils, for example, have a thin surface layer because runoff and erosion are excessive and because the limited amount of moisture does not produce the large amount of vegetation needed for a buildup of organic matter. Because of the limited amount of moisture, they do not have a subsoil.

On the nearly level to gently sloping Holdrege and Hall soils, water penetrates the surface instead of running off and a moderately thick to thick surface layer has formed. Also, a subsoil has formed because the soil moisture has leached carbonates and clay particles out of the surface layer.

The shape of the slope commonly is important in soil formation. The convex upper part of steep slopes sheds water rapidly. As a result, only a limited amount of water enters the soil. Soils that formed in these areas have a thin surface layer and lack a subsoil. Coly soils are an example. In areas where slopes are plane or concave, a thicker surface layer and a subsoil have formed. The soils in depressions receive additional moisture from surrounding areas. This additional moisture contributes to the development of an A2 horizon, or leached layer, directly above a claypan. Fillmore and Scott soils are examples.

In low areas on bottom land, the water table is near the surface. When the soils in these areas are saturated, many physical and chemical reactions are altered. The downward movement of water is restricted. Anaerobic reactions become dominant because of a lack of oxygen. These soils tend to be colder than soils in which aerobic reactions are dominant.

Soils on bottom land commonly receive additional sediments during periods of flooding. They do not form in the usual manner because each flood deposits new parent material and starts a new cycle of soil formation. The stratified Hobbs soils are an example.

time

Several thousand years is needed for the formation of a mature soil and a few tens or hundreds of years for other soils. Soil formation begins once a land surface is reasonably stable. Mature soils commonly have a dark surface layer, a clay-enriched subsoil, and a horizon where calcium carbonates have accumulated. Holdrege, Hall, and Fillmore soils are considered mature. They are approaching an equilibrium with their environment. Hord soils are less mature. They are on stream terraces that have been stable for a comparably short period.

Some soils in Gosper County remain immature because they receive new deposits of soil material, are subject to erosion, or lack the amount of moisture needed for rapid soil formation. The Coly soils on upland side slopes, for example, formed in material the same age as the parent material of Holdrege soils. They are

considered immature, however, because they are steep and runoff is rapid. The amount of moisture available for soil formation is limited, and erosion removes the surface soil material nearly as rapidly as the soil forms.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compact layers to depths below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—
Loose.—Noncoherent when dry or moist; does not hold together in a mass.
Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the removal of water from the soil. Drainage classes are determined on the basis of an overall evaluation of water removal as influenced by climate, slope, and position on the landscape. Precipitation, runoff, amount of moisture infiltrating the soil, and rate of water movement through the soil affect the degree and duration of wetness. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow, very porous, or steep, or a combination of these.
Somewhat excessively drained.—Water is removed from the soil rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow or moderately deep, very porous, or steep, or a combination of these.
Well drained.—Water is removed from the soil so readily that the upper 40 inches generally does not have the mottles or dull colors related to wetness.
Moderately well drained.—Water is removed from the soil so slowly that the upper 20 to 40 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.
Somewhat poorly drained.—Water is removed from the soil so slowly that the upper 10 to 20 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.
Poorly drained.—Water is removed so slowly that either the soil is periodically saturated or the upper 10 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water is at or on the surface most of the time. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that

water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salty water (in tables). Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002

millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slickspot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soils.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A horizon. Includes all subdivisions of this horizon (A1, A2, and A3).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1961-76 at Canaday Steam Plant]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	34.8	11.7	23.3	65	-19	0	0.36	0.06	0.58	1	4.9
February---	41.6	17.4	29.5	75	-8	0	.47	.06	.78	1	3.6
March------	49.5	23.6	36.6	83	-2	31	1.00	.29	1.56	3	3.9
April------	62.9	36.2	49.6	88	15	69	1.72	.78	2.47	4	.8
May--------	73.7	47.2	60.3	96	27	330	3.01	.84	4.76	5	.4
June-------	83.4	57.0	70.2	103	40	606	4.07	1.93	5.81	6	.0
July-------	88.6	63.0	75.8	104	50	800	3.73	1.97	5.17	6	.0
August-----	85.8	60.1	73.0	102	45	713	2.35	1.27	3.22	5	.0
September--	75.4	49.6	62.5	99	30	375	2.47	.97	3.67	5	.0
October----	66.4	38.5	52.4	90	20	172	1.28	.29	2.08	2	1.1
November---	50.2	25.0	37.6	74	4	0	.70	---	1.21	1	2.1
December---	38.0	15.1	26.6	69	-13	0	.50	.07	.82	2	5.2
Yearly:											
Average--	62.5	37.0	49.8	---	---	---	---	---	---	---	---
Extreme--	---	---	---	105	-19	---	---	---	---	---	---
Total----	---	---	---	---	---	3,096	21.66	16.28	26.58	41	22.0

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1961-76 at Canaday Steam Plant]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 21	May 6	May 17
2 years in 10 later than--	April 16	May 1	May 13
5 years in 10 later than--	April 7	April 23	May 5
First freezing temperature in fall:			
1 year in 10 earlier than--	October 14	October 4	September 22
2 years in 10 earlier than--	October 19	October 9	September 28
5 years in 10 earlier than--	October 27	October 18	October 9

TABLE 3.--GROWING SEASON

[Recorded in the period 1961-76 at Canaday Steam Plant]

Probability	Daily minimum temperature		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	183	157	136
8 years in 10	190	164	143
5 years in 10	202	178	156
2 years in 10	215	192	170
1 year in 10	222	199	177

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AnB	Anselmo fine sandy loam, 0 to 3 percent slopes	1,200	0.4
AnC	Anselmo fine sandy loam, 3 to 6 percent slopes	600	0.2
AnD	Anselmo fine sandy loam, 6 to 11 percent slopes	200	0.1
CoD2	Coly silt loam, 6 to 9 percent slopes, eroded	9,850	3.3
CoE2	Coly silt loam, 9 to 20 percent slopes, eroded	8,540	2.9
CpG	Coly-Hobbs silt loams, 2 to 60 percent slopes	35,780	12.0
Cs	Cozad silt loam, 0 to 1 percent slopes	2,380	0.8
CsB	Cozad silt loam, 1 to 3 percent slopes	1,150	0.4
CsC	Cozad silt loam, 3 to 6 percent slopes	450	0.2
Fm	Fillmore silt loam, 0 to 1 percent slopes	670	0.2
Fo	Fillmore silt loam, drained, 0 to 1 percent slopes	610	0.2
Go	Gosper loam, 0 to 2 percent slopes	510	0.2
Gt	Gothenburg fine sandy loam, 0 to 2 percent slopes	84	*
Ha	Hall silt loam, 0 to 1 percent slopes	19,590	6.6
HaB	Hall silt loam, 1 to 3 percent slopes	1,600	0.5
Hd	Hobbs silt loam, 0 to 2 percent slopes	3,070	1.0
HeB	Hobbs silt loam, channeled, 0 to 3 percent slopes	5,810	1.9
Ho	Holdrege silt loam, 0 to 1 percent slopes	27,480	9.2
HoB	Holdrege silt loam, 1 to 3 percent slopes	62,010	20.8
HoC	Holdrege silt loam, 3 to 6 percent slopes	2,080	0.7
HpB	Holdrege-Uly silt loams, 1 to 3 percent slopes	8,950	3.0
HpC2	Holdrege-Uly silt loams, 3 to 6 percent slopes, eroded	23,770	8.0
Hr	Hord silt loam, terrace, 0 to 1 percent slopes	3,210	1.1
HrB	Hord silt loam, terrace, 1 to 3 percent slopes	580	0.2
Hw	Hord silt loam, wet substratum, 0 to 2 percent slopes	350	0.1
Le	Lex loam, 0 to 2 percent slopes	360	0.1
Lf	Lex loam, saline-alkali, 0 to 2 percent slopes	120	*
Pt	Platte loam, 0 to 2 percent slopes	120	*
Sc	Scott silty clay loam, 0 to 1 percent slopes	920	0.3
UbD	Uly silt loam, 6 to 9 percent slopes	2,920	1.0
UbE	Uly silt loam, 9 to 15 percent slopes	9,720	3.3
UcF	Uly-Coly silt loams, 9 to 30 percent slopes	60,540	20.3
UtG	Ustorthents, steep	380	0.1
	Water areas greater than 40 acres in size	2,636	0.9
	Total	298,240	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Only arable soils are listed. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn		Alfalfa hay		Winter wheat	Grain sorghum	
	N	I	N	I	N	N	I
	Bu	Bu	Ton	Ton	Bu	Bu	Bu
AnB----------------------- Anselmo	45	130	2.5	5.0	28	55	110
AnC----------------------- Anselmo	41	120	2.3	4.5	26	48	100
AnD----------------------- Anselmo	30	---	1.9	3.5	20	40	---
CoD2---------------------- Coly	18	30	1.2	4.0	18	20	---
Cs------------------------ Cozad	48	145	2.8	6.2	38	57	120
CsB----------------------- Cozad	38	135	2.5	5.8	34	52	115
CsC----------------------- Cozad	32	120	2.3	5.2	26	48	105
Fm------------------------ Fillmore	40	---	1.8	---	20	55	---
Fo------------------------ Fillmore	50	120	3.1	5.5	30	66	115
Go------------------------ Gosper	35	135	3.0	5.0	30	40	115
Ha------------------------ Hall	48	145	2.7	6.5	42	58	120
HaB----------------------- Hall	45	140	2.5	6.2	40	55	115
Hd------------------------ Hobbs	65	135	4.0	6.0	36	70	120
Ho------------------------ Holdrege	40	145	2.5	6.5	40	50	125
HoB----------------------- Holdrege	35	140	2.3	6.2	36	47	120
HoC----------------------- Holdrege	30	130	2.0	5.8	34	43	115
HpB----------------------- Holdrege-Uly	30	130	2.1	5.8	34	43	115
HpC2---------------------- Holdrege-Uly	23	100	1.7	5.2	28	35	95

TABLE 5.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Corn N	Corn I	Alfalfa hay N	Alfalfa hay I	Winter wheat N	Grain sorghum N	Grain sorghum I
	Bu	Bu	Ton	Ton	Bu	Bu	Bu
Hr----------------------- Hord	50	145	3.0	6.5	38	60	125
HrB---------------------- Hord	40	140	2.5	6.0	35	55	120
Hw----------------------- Hord	64	145	3.5	6.5	45	60	125
Le----------------------- Lex	64	120	3.0	5.5	---	75	110
Lf----------------------- Lex	30	90	1.9	3.2	20	40	85
Pt----------------------- Platte	---	60	1.8	2.5	---	---	65
Sc----------------------- Scott	---	---	---	---	15	30	---
UbD---------------------- Uly	20	---	1.7	4.0	22	25	---

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[All soils are assigned to nonirrigated capability subclasses (N). Only potentially irrigable soils are assigned to irrigated subclasses (I). Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass) Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I (N)	---	---	---	---	---
(I)	53,170	---	---	---	---
II (N)	132,690	75,490	4,030	---	53,170
(I)	79,520	75,490	4,030	---	---
III (N)	27,930	26,900	1,030	---	---
(I)	27,380	26,900	480	---	---
IV (N)	14,010	12,970	920	120	---
(I)	11,970	11,970	---	---	---
V (N)	---	---	---	---	---
VI (N)	84,730	78,800	5,930	---	---
VII (N)	36,244	35,780	---	464	---
VIII(N)	---	---	---	---	---

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
AnB, AnC, AnD: Anselmo	Sandy	Favorable	3,250	Little bluestem	25
		Normal	2,600	Sand bluestem	15
		Unfavorable	1,350	Prairie sandreed	15
				Needleandthread	15
				Blue grama	10
				Buffalograss	5
				Western wheatgrass	5
CoD2, CoE2: Coly	Limy Upland	Favorable	3,000	Little bluestem	25
		Normal	2,300	Big bluestem	20
		Unfavorable	1,500	Blue grama	15
				Sideoats grama	10
				Plains muhly	5
				Western wheatgrass	5
				Sedge	5
CpG*:					
Coly	Thin Loess	Favorable	2,500	Little bluestem	30
		Normal	2,000	Sideoats grama	15
		Unfavorable	1,200	Big bluestem	10
				Plains muhly	10
				Blue grama	10
				Western wheatgrass	5
				Sedge	5
Hobbs	Silty Overflow	Favorable	5,000	Big bluestem	30
		Normal	4,500	Western wheatgrass	12
		Unfavorable	3,500	Switchgrass	10
				Indiangrass	7
				Little bluestem	6
				Sideoats grama	5
				Tall dropseed	5
				Maximilian sunflower	5
				Wholeleaf rosinweed	5
				Sedge	5
				Blue grama	5
Cs, CsB: Cozad	Silty Lowland	Favorable	4,500	Big bluestem	35
		Normal	3,500	Little bluestem	15
		Unfavorable	2,500	Switchgrass	15
				Indiangrass	5
				Sideoats grama	5
				Green muhly	5
				Sedge	5
				Western wheatgrass	5
CsC: Cozad	Silty	Favorable	4,000	Big bluestem	20
		Normal	3,200	Little bluestem	20
		Unfavorable	2,000	Blue grama	10
				Sideoats grama	10
				Western wheatgrass	10
				Switchgrass	5
				Indiangrass	5
				Buffalograss	5
				Sedge	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
Fm, Fo: Fillmore	Clayey Overflow	Favorable	4,000	Big bluestem	20
		Normal[1]	3,250	Western wheatgrass	20
		Unfavorable	2,000	Switchgrass	15
				Little bluestem	10
				Blue grama	10
				Indiangrass	5
				Canada wildrye	5
				Buffalograss	5
				Sedge	5
				Kentucky bluegrass	5
Go: Gosper	Silty Lowland	Favorable	4,500	Big bluestem	30
		Normal	4,000	Little bluestem	15
		Unfavorable	3,000	Switchgrass	10
				Indiangrass	10
				Western wheatgrass	10
				Blue grama	5
				Sideoats grama	5
				Sedge	5
Gt: Gothenburg	Subirrigated	Favorable	2,500	Switchgrass	25
		Normal	2,250	Prairie cordgrass	10
		Unfavorable	2,000	Kentucky bluegrass	10
				Sedge	10
				Russian-olive	10
				Canada wildrye	5
				Eastern cottonwood	5
Ha, HaB: Hall	Silty	Favorable	3,500	Little bluestem	20
		Normal	2,800	Big bluestem	15
		Unfavorable	2,000	Western wheatgrass	15
				Switchgrass	10
				Sideoats grama	7
				Indiangrass	5
				Sedge	5
				Blue grama	5
				Needleandthread	5
Hd, HeB: Hobbs	Silty Overflow	Favorable	5,000	Big bluestem	30
		Normal	4,500	Western wheatgrass	12
		Unfavorable	3,500	Switchgrass	10
				Indiangrass	7
				Little bluestem	6
				Sideoats grama	5
				Tall dropseed	5
				Maximilian sunflower	5
				Wholeleaf rosinweed	5
				Sedge	5
				Blue grama	5
Ho, HoB, HoC: Holdrege	Silty	Favorable	3,400	Big bluestem	20
		Normal	2,700	Little bluestem	20
		Unfavorable	1,800	Sideoats grama	10
				Blue grama	10
				Western wheatgrass	10
				Indiangrass	5
				Buffalograss	5
				Sand dropseed	5
				Sedge	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
HpB*, HpC2*:					
Holdrege	Silty	Favorable	3,400	Big bluestem	20
		Normal	2,700	Little bluestem	20
		Unfavorable	1,800	Sideoats grama	10
				Blue grama	10
				Western wheatgrass	10
				Indiangrass	5
				Buffalograss	5
				Sand dropseed	5
				Sedge	5
Uly	Silty	Favorable	3,200	Big bluestem	35
		Normal	2,400	Little bluestem	25
		Unfavorable	1,500	Western wheatgrass	12
				Blue grama	6
				Sedge	5
Hr, HrB	Silty Lowland	Favorable	4,500	Big bluestem	30
Hord		Normal	3,500	Little bluestem	10
		Unfavorable	2,000	Indiangrass	10
				Switchgrass	10
				Porcupinegrass	8
				Sideoats grama	5
				Tall dropseed	5
				Western wheatgrass	5
				Sedge	5
Hw	Subirrigated	Favorable	5,500	Big bluestem	25
Hord		Normal	4,700	Indiangrass	15
		Unfavorable	4,200	Little bluestem	10
				Switchgrass	10
				Prairie cordgrass	10
				Canada wildrye	5
				Plains bluegrass	5
				Slender wheatgrass	5
Le	Subirrigated	Favorable	6,000	Big bluestem	30
Lex		Normal	5,500	Little bluestem	12
		Unfavorable	4,500	Switchgrass	8
				Indiangrass	8
				Prairie cordgrass	6
				Western wheatgrass	5
				Sedge	5
Lf	Saline Subirrigated	Favorable	5,000	Alkali sacaton	15
Lex		Normal	4,500	Switchgrass	15
		Unfavorable	3,000	Western wheatgrass	15
				Inland saltgrass	10
				Indiangrass	10
				Canada wildrye	5
				Blue grama	5
				Slender wheatgrass	5
				Sedge	5
Pt	Subirrigated	Favorable	4,500	Big bluestem	30
Platte		Normal	4,000	Switchgrass	15
		Unfavorable	3,000	Indiangrass	10
				Prairie cordgrass	10
				Little bluestem	5
				Kentucky bluegrass	5
				Green muhly	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
UbD, UbE: Uly	Silty	Favorable	3,200	Big bluestem	35
		Normal	2,400	Little bluestem	25
		Unfavorable	1,500	Western wheatgrass	12
				Blue grama	6
				Sedge	5
UcF*:					
Uly	Silty	Favorable	3,200	Big bluestem	35
		Normal	2,400	Little bluestem	25
		Unfavorable	1,500	Western wheatgrass	12
				Blue grama	6
				Sedge	5
Coly	Limy Upland	Favorable	3,000	Little bluestem	25
		Normal	2,300	Big bluestem	20
		Unfavorable	1,500	Blue grama	15
				Sideoats grama	10
				Plains muhly	5
				Western wheatgrass	5
				Sedge	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Only the soils suitable for windbreaks or environmental plantings are listed. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
AnB, AnC, AnD-----Anselmo	American plum, Amur honeysuckle, common chokecherry.	Skunkbush sumac	Eastern redcedar, common hackberry, Russian mulberry, green ash, ponderosa pine, Austrian pine, Scotch pine.	Honeylocust-------	---
CoD2-------------Coly	Skunkbush sumac, Siberian peashrub.	Russian-olive, ponderosa pine, Austrian pine, Russian mulberry.	Eastern redcedar, green ash, honeylocust, bur oak, Rocky Mountain juniper.	Siberian elm------	---
Cs, CsB, CsC------Cozad	Lilac, skunkbush sumac, Tatarian honeysuckle.	Russian mulberry, common chokecherry.	Eastern redcedar, green ash, common hackberry, bur oak.	Ponderosa pine, Austrian pine, honeylocust.	---
Fm---------------Fillmore	Redosier dogwood	---	Golden willow-----	---	Eastern cottonwood.
Fo---------------Fillmore	Skunkbush sumac, Tatarian honeysuckle, lilac.	Common chokecherry, Russian mulberry.	Eastern redcedar, common hackberry, bur oak, Austrian pine, ponderosa pine, green ash.	Honeylocust-------	---
Go---------------Gosper	American plum, lilac.	Tatarian honeysuckle.	Eastern redcedar, Russian-olive, Russian mulberry, green ash.	Ponderosa pine, common hackberry, honeylocust, Austrian pine.	Eastern cottonwood.
Ha, HaB----------Hall	Skunkbush sumac, Tatarian honeysuckle, lilac.	Russian mulberry, common chokecherry.	Eastern redcedar, green ash, common hackberry, bur oak.	Ponderosa pine, Austrian pine, honeylocust.	---
Hd---------------Hobbs	Lilac, American plum.	Tatarian honeysuckle.	Green ash, Russian-olive, Russian mulberry, eastern redcedar.	Austrian pine, ponderosa pine, honeylocust, common hackberry.	Eastern cottonwood.
Ho, HoB, HoC------Holdrege	Skunkbush sumac, Tatarian honeysuckle, lilac.	Common chokecherry, Russian mulberry.	Eastern redcedar, Austrian pine, ponderosa pine, common hackberry, bur oak, green ash.	Honeylocust-------	---
HpB*, HpC2*:					
Holdrege----------	Skunkbush sumac, Tatarian honeysuckle, lilac.	Russian mulberry, common chokecherry.	Green ash, eastern redcedar, Austrian pine, ponderosa pine, common hackberry, bur oak.	Honeylocust-------	---
Uly--------------	Tatarian honeysuckle, skunkbush sumac, lilac.	Russian mulberry, common chokecherry.	Bur oak, common hackberry, eastern redcedar, green ash, ponderosa pine, Austrian pine.	Honeylocust-------	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Hr, HrB: Hord	Lilac, American plum.	Tatarian honeysuckle.	Eastern redcedar, Russian mulberry, green ash, Russian-olive.	Ponderosa pine, Austrian pine, honeylocust, common hackberry.	Eastern cottonwood.
Hw: Hord	Lilac, American plum.	Tatarian honeysuckle.	Russian-olive, Eastern redcedar, Austrian pine, Russian mulberry, green ash, ponderosa pine.	Honeylocust, common hackberry.	Eastern cottonwood.
Le: Lex	American plum, redosier dogwood.	Common chokecherry.	Eastern redcedar, Austrian pine, Russian mulberry, common hackberry, green ash.	Honeylocust, golden willow, silver maple.	Eastern cottonwood.
Lf: Lex	Siberian peashrub, skunkbush sumac, silver buffaloberry.	Eastern redcedar, Rocky Mountain juniper, Russian-olive.	Ponderosa pine, green ash, honeylocust, golden willow, Siberian elm.	---	Eastern cottonwood.
Pt: Platte	American plum, redosier dogwood.	Common chokecherry.	Eastern redcedar, Austrian pine, Russian mulberry, common hackberry, green ash.	Golden willow, honeylocust, silver maple.	Eastern cottonwood.
UbD, UbE: Uly	Tatarian honeysuckle, skunkbush sumac, lilac.	Russian mulberry, common chokecherry.	Bur oak, eastern redcedar, ponderosa pine, green ash, Austrian pine, common hackberry.	Honeylocust	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AnB------------------- Anselmo	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
AnC------------------- Anselmo	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
AnD------------------- Anselmo	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
CoD2------------------ Coly	Slight----------	Slight----------	Severe: slope.	Severe: erodes easily.	Slight.
CoE2------------------ Coly	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
CpC*:					
Coly-----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Hobbs----------------	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
Cs-------------------- Cozad	Severe: floods.	Slight----------	Slight----------	Slight----------	Slight.
CsB, CsC-------------- Cozad	Severe: floods.	Slight----------	Moderate: slope.	Slight----------	Slight.
Fm-------------------- Fillmore	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
Fo-------------------- Fillmore	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Go-------------------- Gosper	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
Gt-------------------- Gothenburg	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.
Ha-------------------- Hall	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
HaB------------------- Hall	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
Hd-------------------- Hobbs	Severe: floods.	Slight----------	Moderate: floods.	Slight----------	Moderate: floods.
HeB------------------- Hobbs	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
Ho-------------------- Holdrege	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
HoB, HoC-------------- Holdrege	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
HpB*, HpC2*:					
Holdrege--------------	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HpB*, HpC2*:					
Uly	Slight	Slight	Moderate: slope.	Slight	Slight.
Hr Hord	Slight	Slight	Slight	Slight	Slight.
HrB Hord	Slight	Slight	Moderate: slope.	Slight	Slight.
Hw Hord	Severe: floods.	Slight	Slight	Slight	Slight.
Le Lex	Severe: floods.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Lf Lex	Severe: excess salt, floods.	Severe: excess salt.	Severe: excess salt.	Slight	Severe: excess salt.
Pt Platte	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty, floods.
Sc Scott	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, erodes easily.	Severe: ponding.
UbD Uly	Slight	Slight	Severe: slope.	Slight	Slight.
UbE Uly	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
UcF*:					
Uly	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
UtG*. Ustorthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
AnB: Anselmo	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
AnC, AnD: Anselmo	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
CoD2: Coly	Fair	Good	Good	Good	Fair	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
CoE2: Coly	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
CpG*:												
Coly	Very poor.	Very poor.	Poor	Poor	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
Hobbs	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Cs, CsB: Cozad	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
CsC: Cozad	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Fm: Fillmore	Fair	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Good	Fair.
Fo: Fillmore	Good	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Fair	Good.
Go: Gosper	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
Gt: Gothenburg	Very poor.	Very poor.	Fair	Poor	Fair	Fair	Fair	Good	Poor	Poor	Fair	Fair.
Ha, HaB: Hall	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Hd: Hobbs	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
HeB: Hobbs	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Ho, HoB: Holdrege	Good	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Fair.
HoC: Holdrege	Fair	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
HpB*:												
Holdrege	Good	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Fair.
Uly	Good	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Good.
HpC2*:												
Holdrege	Fair	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
HpC2*:												
Uly	Fair	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Hr, HrB Hord	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Hw Hord	Good	Good	Good	Fair	Good	Good	Fair	Fair	Good	Fair	Fair	Good.
Le Lex	Fair	Fair	Good	Fair	Good	Good	Fair	Fair	Fair	Fair	Fair	Good.
Lf Lex	Fair	Fair	Poor	Good	Good	Poor	Fair	Fair	Fair	Good	Fair	Poor.
Pt Platte	Fair	Good	Fair	Poor	Fair	Good	Fair	Good	Fair	Poor	Good	Fair.
Sc Scott	Poor	Fair	Fair	Poor	Poor	Poor	Good	Good	Fair	Poor	Good	Fair.
UbD Uly	Fair	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
UbE Uly	Poor	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
UcF*:												
Uly	Poor	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Coly	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
UtG*. Ustorthents												

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AnB---------------- Anselmo	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Moderate: frost action.	Slight.
AnC---------------- Anselmo	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Moderate: frost action.	Slight.
AnD---------------- Anselmo	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
CoD2--------------- Coly	Slight----------	Slight----------	Slight----------	Moderate: slope.	Severe: low strength.	Slight.
CoE2--------------- Coly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
CpG*: Coly--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Hobbs-------------	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Severe: floods.
Cs, CsB, CsC------- Cozad	Slight----------	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, frost action.	Slight.
Fm----------------- Fillmore	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, low strength, frost action.	Severe: ponding.
Fo----------------- Fillmore	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, low strength, frost action.	Severe: wetness.
Go----------------- Gosper	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
Gt----------------- Gothenburg	Severe: wetness, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness.
Ha, HaB------------ Hall	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Hd----------------- Hobbs	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Severe: floods.
HeB---------------- Hobbs	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Severe: floods.
Ho, HoB------------ Holdrege	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
HoC---------------- Holdrege	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
HpB*:						
Holdrege	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Uly	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
HpC2*:						
Holdrege	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Uly	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
Hr, HrB: Hord	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
Hw: Hord	Moderate: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength.	Slight.
Le: Lex	Severe: wetness, cutbanks cave.	Severe: floods.	Severe: wetness, floods.	Severe: floods.	Severe: frost action, low strength.	Moderate: wetness.
Lf: Lex	Severe: cutbanks cave, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: frost action.	Severe: excess salt.
Pt: Platte	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.	Moderate: wetness, droughty, floods.
Sc: Scott	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
UbD: Uly	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
UbE: Uly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
UcF*:						
Uly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
UtG*. Ustorthents						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AnB, AnC: Anselmo	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
AnD: Anselmo	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
CoD2: Coly	Slight	Severe: slope.	Slight	Slight	Good.
CoE2: Coly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
CpG*:					
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Hobbs	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
Cs, CsB, CsC: Cozad	Moderate: floods, percs slowly.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
Fm: Fillmore	Severe: percs slowly, ponding.	Severe: ponding.	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Fo: Fillmore	Severe: percs slowly, wetness.	Severe: wetness.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Go: Gosper	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness, thin layer.
Gt: Gothenburg	Severe: wetness, floods, poor filter.	Severe: wetness, seepage, floods.	Severe: wetness, seepage, floods.	Severe: wetness, seepage, floods.	Poor: wetness, too sandy, seepage.
Ha, HaB: Hall	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey.
Hd, HeB: Hobbs	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
Ho: Holdrege	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
HoB, HoC: Holdrege	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
HpB*, HpC2*:					
Holdrege	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Uly	Slight	Moderate: seepage, slope.	Slight	Slight	Good.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Hr------------------ Hord	Slight-----------	Moderate: seepage.	Slight-----------	Slight-----------	Good.
HrB----------------- Hord	Slight-----------	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
Hw------------------ Hord	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
Le------------------ Lex	Severe: wetness, poor filter.	Severe: wetness, floods, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: too sandy, seepage.
Lf------------------ Lex	Severe: wetness, poor filter.	Severe: seepage, wetness, floods.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Pt------------------ Platte	Severe: floods, wetness, poor filter.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy, wetness.
Sc------------------ Scott	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
UbD----------------- Uly	Slight-----------	Severe: slope.	Slight-----------	Slight-----------	Good.
UbE----------------- Uly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
UcF*:					
Uly-----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Coly----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
UtG*. Ustorthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AnB, AnC-------------- Anselmo	Good-----------------	Probable-------------	Improbable: too sandy.	Fair: thin layer.
AnD------------------- Anselmo	Good-----------------	Probable-------------	Improbable: too sandy.	Fair: thin layer, slope.
CoD2------------------ Coly	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
CoE2------------------ Coly	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
CpG*:				
Coly-----------------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Hobbs----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Cs, CsB, CsC---------- Cozad	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
Fm, Fo---------------- Fillmore	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, thin layer.
Go-------------------- Gosper	Good-----------------	Probable-------------	Improbable: too sandy.	Good.
Gt-------------------- Gothenburg	Poor: wetness.	Probable-------------	Probable-------------	Poor: small stones, wetness.
Ha, HaB--------------- Hall	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hd, HeB--------------- Hobbs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ho, HoB, HoC---------- Holdrege	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
HpB*, HpC2*:				
Holdrege-------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Uly------------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hr, HrB, Hw----------- Hord	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Le-------------------- Lex	Fair: wetness.	Probable-------------	Probable-------------	Fair: area reclaim.
Lf-------------------- Lex	Fair: wetness.	Probable-------------	Improbable: too sandy.	Poor: excess salt.
Pt-------------------- Platte	Fair: wetness.	Probable-------------	Probable-------------	Poor: area reclaim, small stones.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Sc-------------------- Scott	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
UbD------------------- Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
UbE------------------- Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
UcF*:				
Uly-------------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Coly------------------	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
UtG*. Ustorthents				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
AnB: Anselmo	Severe: seepage.	Severe: no water.	Deep to water	Favorable	Too sandy, soil blowing.	Favorable.
AnC: Anselmo	Severe: seepage.	Severe: no water.	Deep to water	Slope	Too sandy, soil blowing.	Favorable.
AnD: Anselmo	Severe: seepage, slope.	Severe: no water.	Deep to water	Slope	Slope, too sandy, soil blowing.	Slope.
CoD2: Coly	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
CoE2: Coly	Severe: slope.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
CpG*:						
Coly	Severe: slope.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Hobbs	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope, floods.	Favorable	Favorable.
Cs, CsB: Cozad	Moderate: seepage.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
CsC: Cozad	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Fm: Fillmore	Moderate: seepage.	Severe: no water.	Percs slowly, frost action, ponding.	Percs slowly, ponding, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Fo: Fillmore	Moderate: seepage.	Severe: no water.	Percs slowly, frost action.	Percs slowly, wetness, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Go: Gosper	Severe: seepage.	Severe: cutbanks cave.	Deep to water	Favorable	Favorable	Favorable.
Gt: Gothenburg	Severe: seepage.	Severe: cutbanks cave.	Floods	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Ha, HaB: Hall	Moderate: seepage.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
Hd, HeB: Hobbs	Moderate: seepage.	Severe: no water.	Deep to water	Floods	Favorable	Favorable.
Ho, HoB: Holdrege	Moderate: seepage.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
HoC: Holdrege	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
HpB*:						
Holdrege	Moderate: seepage.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
Uly	Moderate: seepage.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
HpC2*:						
Holdrege	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Uly	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Hr, HrB Hord	Moderate: seepage.	Severe: no water.	Deep to water	Favorable	Favorable	Favorable.
Hw Hord	Moderate: seepage.	Moderate: deep to water, slow refill.	Favorable	Wetness	Wetness	Favorable.
Le Lex	Severe: seepage.	Severe: slow refill, cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness, too sandy.	Favorable.
Lf Lex	Severe: seepage.	Severe: slow refill, salty water, cutbanks cave.	Frost action, cutbanks cave, excess salt.	Wetness, excess salt.	Wetness, too sandy.	Excess salt.
Pt Platte	Severe: seepage.	Severe: cutbanks cave.	Floods, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
Sc Scott	Moderate: seepage.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
UbD Uly	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
UbE Uly	Severe: slope.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
UcF*:						
Uly	Severe: slope.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Coly	Severe: slope.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
UtG*. Ustorthents						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
AnB, AnC, AnD---- Anselmo	0-7	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4, A-2	0	100	100	60-100	30-65	<20	NP-5
	7-26	Fine sandy loam, loam.	SM, ML, SM-SC, CL-ML	A-4	0	100	100	90-100	35-65	<24	NP-5
	26-60	Fine sandy loam, loamy fine sand, very fine sandy loam.	SM, SP-SM	A-4, A-2	0	100	100	65-100	12-40	<20	NP
CoD2, CoE2------- Coly	0-60	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	22-40	2-20
CpG*:											
Coly------------	0-60	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	22-40	2-20
Hobbs-----------	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	25-40	5-20
Cs, CsB, CsC----- Cozad	0-13	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	75-100	20-35	2-12
	13-33	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-95	20-35	2-12
	33-60	Silt loam, very fine sandy loam, fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	80-100	50-95	20-35	2-12
Fm, Fo----------- Fillmore	0-17	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	95-100	20-40	2-20
	17-34	Silty clay, clay	CH, CL	A-7	0	100	100	100	95-100	41-75	20-45
	34-39	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-60	20-40
	39-60	Silt loam, silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	100	95-100	25-75	10-45
Go--------------- Gosper	0-12	Loam-------------	ML, CL, SM, SC	A-4, A-6	0	100	95-100	70-100	40-90	20-35	2-14
	12-24	Fine sandy loam, loam, sandy clay loam.	SC, CL	A-6, A-4	0	100	95-100	70-100	36-80	20-35	8-20
	24-52	Fine sandy loam, sandy loam, loam.	CL-ML, SC, CL, SM-SC	A-6, A-4	0	100	95-100	70-100	40-70	20-30	4-12
	52-60	Loamy sand, sand, coarse sand.	SP, SM	A-2, A-3	0	100	95-100	50-75	0-30	---	NP
Gt--------------- Gothenburg	0-5	Fine sandy loam	CL-ML, ML, SM, SM-SC	A-2, A-4	0	100	100	60-100	30-90	20-35	2-10
	5-60	Sand and gravel	SP, SM, SP-SM	A-1, A-2, A-3	0	70-95	65-95	30-65	3-15	---	NP
Ha, HaB---------- Hall	0-14	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	25-40	5-20
	14-40	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	15-30
	40-60	Silt loam, silty clay loam.	CL	A-6	0	100	100	95-100	90-100	25-40	10-20
Hd, HeB---------- Hobbs	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	8-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	25-40	5-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ho, HoB, HoC----- Holdrege	0-12	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	20-40	2-18
	12-20	Silty clay loam	CL	A-7, A-6	0	100	100	98-100	95-100	30-50	15-35
	20-23	Silt loam, silty clay loam.	CL, ML	A-6, A-4	0	100	100	95-100	95-100	25-40	2-20
	23-60	Silt loam--------	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15
HpB*:											
Holdrege--------	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	20-40	2-18
	6-15	Silty clay loam	CL	A-7, A-6	0	100	100	98-100	95-100	30-50	15-35
	15-20	Silt loam, silty clay loam.	CL, ML	A-6, A-4	0	100	100	95-100	95-100	25-40	2-20
	20-60	Silt loam--------	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15
Uly-------------	0-6	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	6-15	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	15-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	7-15
HpC2*:											
Holdrege--------	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	20-40	2-18
	8-11	Silty clay loam	CL	A-7, A-6	0	100	100	98-100	95-100	30-50	15-35
	11-14	Silt loam, silty clay loam.	CL, ML	A-6, A-4	0	100	100	95-100	95-100	25-40	2-20
	14-60	Silt loam--------	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15
Uly-------------	0-5	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	5-9	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	9-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	7-15
Hr, HrB---------- Hord	0-14	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-35	3-18
	14-30	Silt loam, silty clay loam, loam.	CL	A-6, A-4	0	100	100	98-100	85-100	25-40	8-23
	30-60	Silt loam, very fine sandy loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	100	85-100	25-40	6-21
Hw--------------- Hord	0-12	Silt loam--------	CL	A-4, A-6	0	100	100	100	90-100	20-35	7-18
	12-33	Silt loam, loam, silty clay loam.	CL	A-4, A-6	0	100	100	100	90-100	25-40	8-23
	33-60	Silt loam, very fine sandy loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	100	90-100	25-40	6-21
Le--------------- Lex	0-12	Loam, silt loam	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-95	22-35	3-15
	12-29	Stratified sandy loam to silty clay loam.	CL, ML, CL-ML	A-6, A-4, A-7	0	95-100	95-100	85-100	60-90	20-45	3-25
	29-60	Gravelly sand, coarse sand, fine sand.	SP, SP-SM, SM	A-2, A-1, A-3	0	60-100	60-95	30-65	3-14	<20	NP
Lf--------------- Lex	0-9	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-95	20-35	3-15
	9-18	Clay loam--------	CL	A-6	0	95-100	95-100	90-100	70-85	20-40	12-27
	18-24	Fine sandy loam	SM, ML	A-4	0	95-100	95-100	70-85	40-55	20-35	NP-10
	24-60	Gravelly sand, sand.	SP, SM, SP-SM	A-2	0	80-100	70-100	35-70	3-15	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Pt----------------- Platte	0-5	Loam-------------	CL-ML, CL	A-4, A-6	0	100	95-100	85-100	60-95	22-35	4-15
	5-12	Very fine sandy loam, loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	95-100	75-95	45-75	<20	NP-5
	12-60	Gravelly coarse sand, coarse sand.	SP-SM, SM	A-1, A-2, A-3	0	70-95	50-95	25-65	5-15	<20	NP
Sc----------------- Scott	0-6	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	2-20
	6-18	Silty clay, clay	CH, CL	A-7	0	100	100	100	95-100	42-75	20-45
	18-36	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-60	20-40
	36-60	Silt loam, silty clay loam, clay loam.	CL	A-4, A-6, A-7	0	100	100	90-100	90-100	25-50	8-24
UbD, UbE---------- Uly	0-10	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	10-24	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	24-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	7-15
UcF*:											
Uly--------------	0-7	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	7-15	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	15-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	7-15
Coly-------------	0-60	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	22-40	2-20
UtG*. Ustorthents											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cm3	In/hr	In/in	pH	mmhos/cm					Pct
AnB, AnC, AnD----- Anselmo	0-7	10-18	1.30-1.60	0.6-6.0	0.13-0.18	6.1-7.8	<2	Low--------	0.20	5	3	1-2
	7-26	10-18	1.40-1.60	2.0-6.0	0.15-0.19	6.6-7.8	<2	Low--------	0.20			
	26-60	5-18	1.50-1.70	2.0-6.0	0.08-0.16	6.6-8.4	<2	Low--------	0.20			
CoD2, CoE2-------- Coly	0-60	18-24	1.30-1.50	0.6-2.0	0.20-0.22	7.4-8.4	<2	Low--------	0.43	5	6	.5-1
CpG*:												
Coly-------------	0-60	18-24	1.30-1.50	0.6-2.0	0.20-0.22	7.4-8.4	<2	Low--------	0.43	5	6	1-2
Hobbs------------	0-7	15-30	1.10-1.30	0.6-2.0	0.21-0.24	6.1-7.8	<2	Low--------	0.32	5	6	2-4
	7-60	18-30	1.20-1.40	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.32			
Cs, CsB, CsC------ Cozad	0-13	11-25	1.30-1.50	0.6-2.0	0.20-0.22	6.1-7.3	<2	Low--------	0.32	5	6	2-4
	13-33	10-18	1.30-1.50	0.6-2.0	0.17-0.19	6.1-8.4	<2	Low--------	0.43			
	33-60	8-18	1.20-1.40	0.6-2.0	0.15-0.19	6.6-8.4	<2	Low--------	0.24			
Fm, Fo------------ Fillmore	0-17	18-35	1.30-1.40	0.6-2.0	0.21-0.24	5.6-6.5	<2	Moderate	0.37	4	6	2-4
	17-34	45-55	1.10-1.20	<0.06	0.11-0.14	5.6-7.8	<2	High-------	0.37			
	34-39	30-40	1.15-1.30	0.2-0.6	0.18-0.20	6.6-7.8	<2	High-------	0.37			
	39-60	18-45	1.30-1.50	0.6-2.0	0.20-0.22	6.6-8.4	<2	Moderate	0.37			
Go---------------- Gosper	0-12	14-22	1.50-1.60	0.6-6.0	0.16-0.24	6.6-8.4	<2	Low--------	0.28	5	6	2-4
	12-24	18-27	1.40-1.50	0.6-2.0	0.15-0.19	6.6-8.4	<2	Moderate	0.28			
	24-52	14-20	1.50-1.60	2.0-6.0	0.12-0.19	7.4-8.4	<2	Low--------	0.28			
	52-60	4-10	1.60-1.70	>6.0	0.05-0.10	7.4-8.4	<2	Low--------	0.28			
Gt---------------- Gothenburg	0-5	5-12	1.70-1.90	2.0-6.0	0.13-0.22	6.6-8.4	<2	Low--------	0.24	2	3	.5-1
	5-60	0-2	2.10-2.30	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Ha, HaB----------- Hall	0-14	20-27	1.30-1.40	0.6-2.0	0.20-0.24	6.1-7.3	<2	Moderate	0.32	5	6	2-4
	14-40	28-35	1.30-1.50	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.43			
	40-60	15-30	1.30-1.40	0.6-2.0	0.18-0.22	6.6-8.4	<2	Moderate	0.43			
Hd, HeB----------- Hobbs	0-8	15-30	1.10-1.30	0.6-2.0	0.21-0.24	6.1-7.8	<2	Low--------	0.32	5	6	2-4
	8-60	18-30	1.20-1.40	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.32			
Ho, HoB, HoC------ Holdrege	0-12	15-25	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.32	5	6	1-4
	12-20	28-35	1.20-1.40	0.6-2.0	0.18-0.20	6.6-7.8	<2	Moderate	0.43			
	20-23	18-30	1.30-1.50	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
	23-60	15-20	1.40-1.60	0.6-2.0	0.20-0.22	7.4-8.4	<2	Moderate	0.43			
HpB*:												
Holdrege---------	0-6	15-25	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.32	5	6	1-4
	6-15	28-35	1.20-1.40	0.6-2.0	0.18-0.20	6.6-7.8	<2	Moderate	0.43			
	15-20	18-30	1.30-1.50	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
	20-60	15-20	1.40-1.60	0.6-2.0	0.20-0.22	7.4-8.4	<2	Moderate	0.43			
Uly--------------	0-6	15-25	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	6	1-4
	6-15	20-32	1.20-1.30	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.43			
	15-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
HpC2*:												
Holdrege---------	0-8	15-25	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.32	5	6	1-2
	8-11	28-35	1.20-1.40	0.6-2.0	0.18-0.20	6.6-7.8	<2	Moderate	0.43			
	11-14	18-30	1.30-1.50	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
	14-60	15-20	1.40-1.60	0.6-2.0	0.20-0.22	7.4-8.4	<2	Moderate	0.43			
Uly--------------	0-5	15-25	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	6	1-2
	5-9	20-32	1.20-1.30	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.43			
	9-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cm3	In/hr	In/in	pH	mmhos/cm					Pct
Hr, HrB---------- Hord	0-14	17-27	1.30-1.40	0.6-2.0	0.20-0.24	6.1-7.3	<2	Low-------	0.32	5	6	2-4
	14-30	20-32	1.35-1.45	0.6-2.0	0.17-0.22	6.6-7.8	<2	Low-------	0.32			
	30-60	18-30	1.30-1.50	0.6-2.0	0.17-0.22	6.6-8.4	<2	Low-------	0.43			
Hw--------------- Hord	0-12	17-25	1.30-1.40	0.6-2.0	0.20-0.24	6.6-7.3	<2	Low-------	0.32	5	6	2-4
	12-33	20-30	1.35-1.45	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low-------	0.32			
	33-60	18-30	1.30-1.50	0.6-2.0	0.20-0.22	7.9-8.4	<2	Low-------	0.32			
Le--------------- Lex	0-12	15-27	1.40-1.60	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low-------	0.28	4	4L	2-4
	12-29	18-32	1.30-1.70	0.6-2.0	0.15-0.22	6.1-9.0	<2	Low-------	0.28			
	29-60	2-5	2.00-2.20	>20	0.02-0.06	6.1-7.8	<2	Low-------	0.10			
Lf--------------- Lex	0-9	15-25	1.40-1.60	0.6-2.0	0.20-0.24	7.9-9.0	8-16	Low-------	0.28	4	5	2-4
	9-18	27-32	1.40-1.60	0.2-0.6	0.15-0.19	>9.0	8-16	Moderate	0.32			
	18-24	10-20	1.50-1.60	2.0-6.0	0.15-0.17	8.5-9.0	>16	Low-------	0.24			
	24-60	2-10	1.50-1.70	>20	0.02-0.05	7.9-8.4	2-4	Low-------	0.10			
Pt--------------- Platte	0-5	10-20	1.50-1.70	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low-------	0.28	2	4L	1-2
	5-12	7-18	1.70-1.90	0.6-2.0	0.15-0.19	6.6-8.4	<2	Low-------	0.28			
	12-60	0-3	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low-------	0.10			
Sc--------------- Scott	0-6	15-35	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low-------	0.37	4	6	2-4
	6-18	40-55	1.30-1.50	<0.06	0.10-0.14	5.6-7.8	<2	High------	0.37			
	18-36	32-40	1.10-1.40	0.2-0.6	0.18-0.20	6.6-7.8	<2	High------	0.37			
	36-60	18-40	1.30-1.50	0.6-2.0	0.14-0.22	6.6-7.8	<2	Moderate	0.37			
UbD, UbE--------- Uly	0-10	15-25	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low-------	0.32	5	6	2-4
	10-24	20-32	1.20-1.30	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low-------	0.43			
	24-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low-------	0.43			
UcF*: Uly-------------	0-7	15-25	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low-------	0.32	5	6	2-4
	7-15	20-32	1.20-1.30	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low-------	0.43			
	15-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low-------	0.43			
Coly-------------	0-60	18-24	1.30-1.50	0.6-2.0	0.20-0.22	7.4-8.4	<2	Low-------	0.43	5	6	1-2
UtG*. Ustorthents												

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the text explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AnB, AnC, AnD----- Anselmo	A	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
CoD2, CoE2-------- Coly	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
CpG*:												
Coly-------------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Hobbs------------	B	Frequent----	Brief-----	Apr-Sep	>6.0	---	---	>60	---	Moderate	Low------	Low.
Cs, CsB, CsC------ Cozad	B	Rare--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Fm---------------- Fillmore	D	None--------	---	---	+.5-1.0	Perched	Mar-Jul	>60	---	High-----	High-----	Low.
Fo---------------- Fillmore	D	None--------	---	---	0-1.0	Perched	Mar-Jul	>60	---	High-----	High-----	Low.
Go---------------- Gosper	B	None--------	---	---	3.0-5.0	Apparent	Nov-May	>60	---	Moderate	High-----	Low.
Gt---------------- Gothenburg	D	Frequent----	Brief-----	Mar-Jun	0-2.0	Apparent	Nov-Jun	>60	---	Moderate	Moderate	Low.
Ha, HaB----------- Hall	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Hd---------------- Hobbs	B	Occasional	Brief-----	Apr-Sep	>6.0	---	---	>60	---	Moderate	Low------	Low.
HeB--------------- Hobbs	B	Frequent----	Brief-----	Apr-Sep	>6.0	---	---	>60	---	Moderate	Low------	Low.
Ho, HoB, HoC------ Holdrege	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
HpB*, HpC2*:												
Holdrege---------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Uly--------------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Hr, HrB----------- Hord	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Hw---------------- Hord	B	Rare--------	---	---	2.0-4.0	Apparent	Mar-Jul	>60	---	Moderate	Moderate	Low.
Le---------------- Lex	B	Rare--------	---	---	1.5-3.0	Apparent	Nov-May	>60	---	High-----	High-----	Low.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Lf----------------- Lex	B	Rare---------	---	---	2.0-5.0	Apparent	May-Nov	>60	---	High-----	High-----	High.
Pt----------------- Platte	B/D	Occasional	Brief-----	Mar-Oct	1.0-2.0	Apparent	Feb-Jun	>60	---	Moderate	Low------	Low.
Sc----------------- Scott	D	None---------	---	---	+.5-1.0	Perched	Mar-Aug	>60	---	High-----	High-----	Low.
UbD, UbE----------- Uly	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
UcF*: Uly---------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Coly---------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
UtG*. Ustorthents												

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution							Liquid limit	Plasticity index	Particle density
			Percentage passing sieve--				Percentage smaller than--					
	AASHTO	Unified	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm			
										Pct		g/cc
Anselmo fine sandy loam: (S76NE-073-014)												
Ap------- 0 to 7	A-2-4(00)	SM	100	100	97	34	27	10	9	--	NP	2.64
B2-------15 to 26	A-4(01)	SM	100	100	98	39	29	15	13	21	3	2.63
C1-------26 to 50	A-2-4(00)	SM	100	100	97	31	22	12	11	18	NP	2.65
Coly silt loam: (S76NE-073-012)												
A1------- 0 to 5	A-6(09)	ML	100	100	100	96	84	18	15	39	12	2.60
C-------- 8 to 60	A-4(08)	ML	100	100	100	98	89	21	15	31	6	2.68
Hall silt loam: (S76NE-073-010)												
Ap------- 0 to 8	A-6(09)	CL	100	100	100	98	92	28	22	35	12	2.58
B21t-----14 to 22	A-7-6(12)	CL	100	100	100	98	92	34	26	41	19	2.63
B3-------30 to 40	A-6(10)	CL	100	100	100	98	92	29	25	36	14	2.66
Hobbs silt loam: (S76NE-073-018)												
C1------- 8 to 22	A-6(10)	CL	100	100	100	99	91	28	21	38	14	2.62
Holdrege silt loam: (S76NE-073-011)												
Ap------- 0 to 7	A-4(08)	CL	100	100	100	96	85	25	22	32	10	2.58
B21t-----13 to 18	A-7-6(13)	CL	100	100	100	96	87	38	33	43	21	2.66
C1-------24 to 36	A-6(09)	CL	100	100	100	98	89	23	17	36	12	2.67
Hord silt loam: (S76NE-073-008)												
A12------ 7 to 14	A-4(08)	ML	100	100	99	89	75	18	16	32	7	2.59
B2-------14 to 24	A-4(08)	ML	100	100	99	88	75	19	16	31	8	2.62
C1-------30 to 50	A-4(08)	ML	100	100	100	93	78	17	14	32	7	2.66
Scott silty clay loam: (S76NE-073-013)												
A1------- 0 to 3	A-7-6(19)	CH	100	100	100	96	92	52	44	55	31	2.59
B21t----- 6 to 18	A-7-6(18)	CH	100	100	100	98	93	47	41	52	30	2.63
C--------36 to 60	A-6(08)	CL	100	100	100	98	90	30	24	34	11	2.65

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Anselmo	Coarse-loamy, mixed, mesic Typic Haplustolls
Coly	Fine-silty, mixed (calcareous), mesic Typic Ustorthents
Cozad	Coarse-silty, mixed, mesic Fluventic Haplustolls
Fillmore	Fine, montmorillonitic, mesic Typic Argialbolls
Gosper	Fine-loamy, mixed, mesic Typic Argiustolls
Gothenburg	Mixed, mesic Typic Psammaquents
Hall	Fine-silty, mixed, mesic Pachic Argiustolls
Hobbs	Fine-silty, mixed, nonacid, mesic Mollic Ustifluvents
Holdrege	Fine-silty, mixed, mesic Typic Argiustolls
Hord	Fine-silty, mixed, mesic Cumulic Haplustolls
Lex	Fine-loamy over sandy or sandy-skeletal, mixed (calcareous), mesic Fluvaquentic Haplaquolls
Platte	Sandy, mixed, mesic Mollic Fluvaquents
Scott	Fine, montmorillonitic, mesic Typic Argialbolls
Uly	Fine-silty, mixed, mesic Typic Haplustolls
Ustorthents	Mixed, mesic Typic Ustorthents

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
UNIVERSITY OF NEBRASKA CONSERVATION AND SURVEY DIVISION

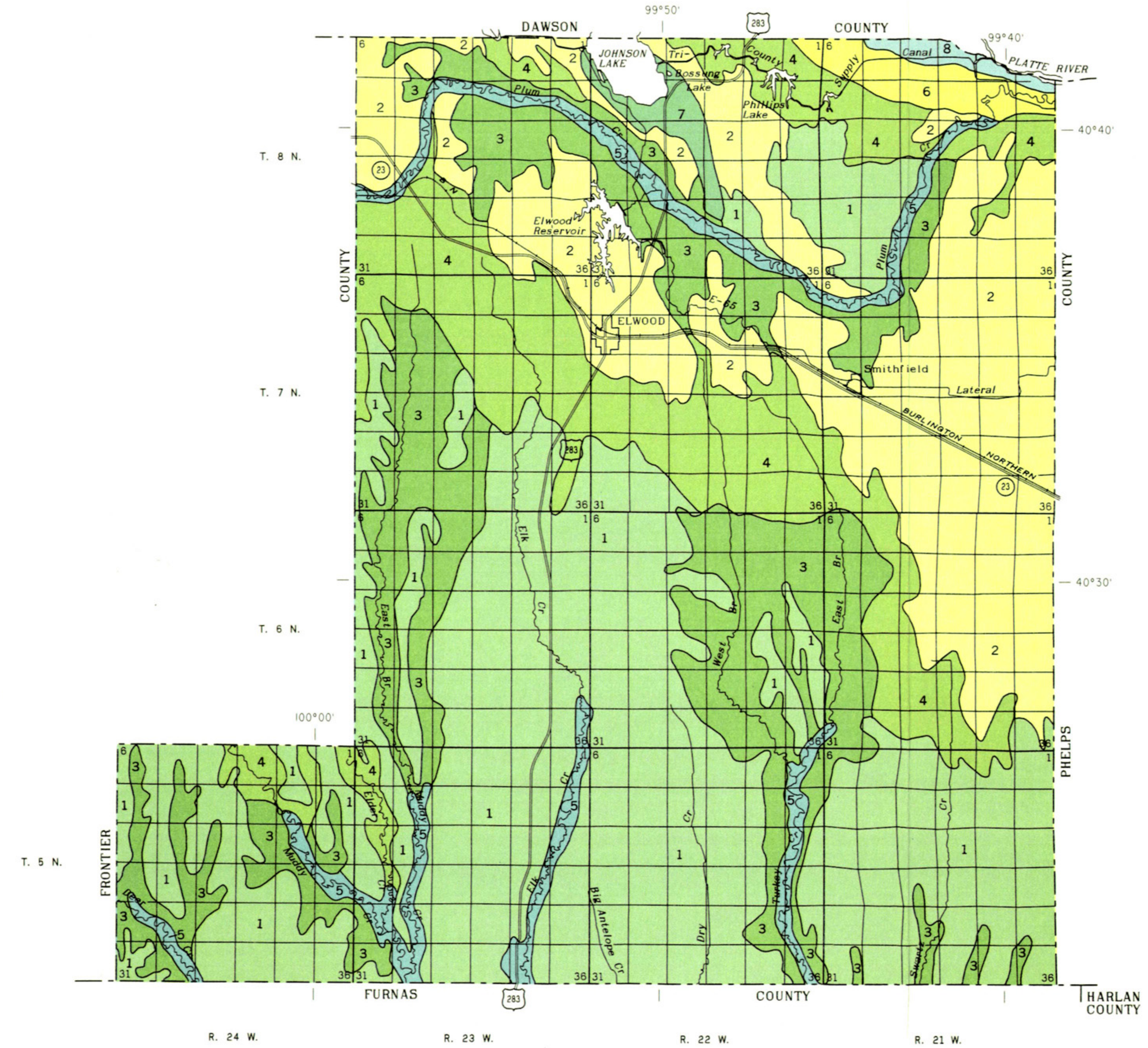
GENERAL SOIL MAP

GOSPER COUNTY, NEBRASKA

Scale 1:190,080

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers



SOIL LEDGEND*

1	Holdrege-Uly-Coly association: Deep, very gently sloping to steep, well drained and somewhat excessively drained, silty soils formed in loess on uplands
2	Holdrege-Hall association: Deep, nearly level and very gently sloping, well drained, silty soils formed in loess on uplands
3	Uly-Coly association: Deep, strongly sloping to steep, well drained and somewhat excessively drained, silty soils formed in loess on uplands
4	Coly-Uly-Hobbs association: Deep, very gently sloping to very steep, well drained to excessively drained, silty soils formed in loess and alluvium on uplands and flood plains
5	Hobbs-Cozad-Hord association: Deep, nearly level to gently sloping, well drained, silty soils formed in alluvium and loess on flood plains, stream terraces, and foot slopes
6	Cozad-Hord association: Deep, nearly level to gently sloping, well drained, silty soils formed in alluvium and loess on stream terraces and foot slopes
7	Anselmo association: Deep, very gently sloping to strongly sloping, well drained, loamy soils formed in eolian deposits on uplands
8	Gosper-Lex association: Nearly level, moderately well drained and somewhat poorly drained, loamy soils that are deep or are moderately deep over sand and gravel; formed in alluvium on low terraces and bottom land

*The texture terms specified in the descriptive headings refer to the surface layer of the major soils in each association.

Compiled 1980

SECTIONALIZED TOWNSHIP

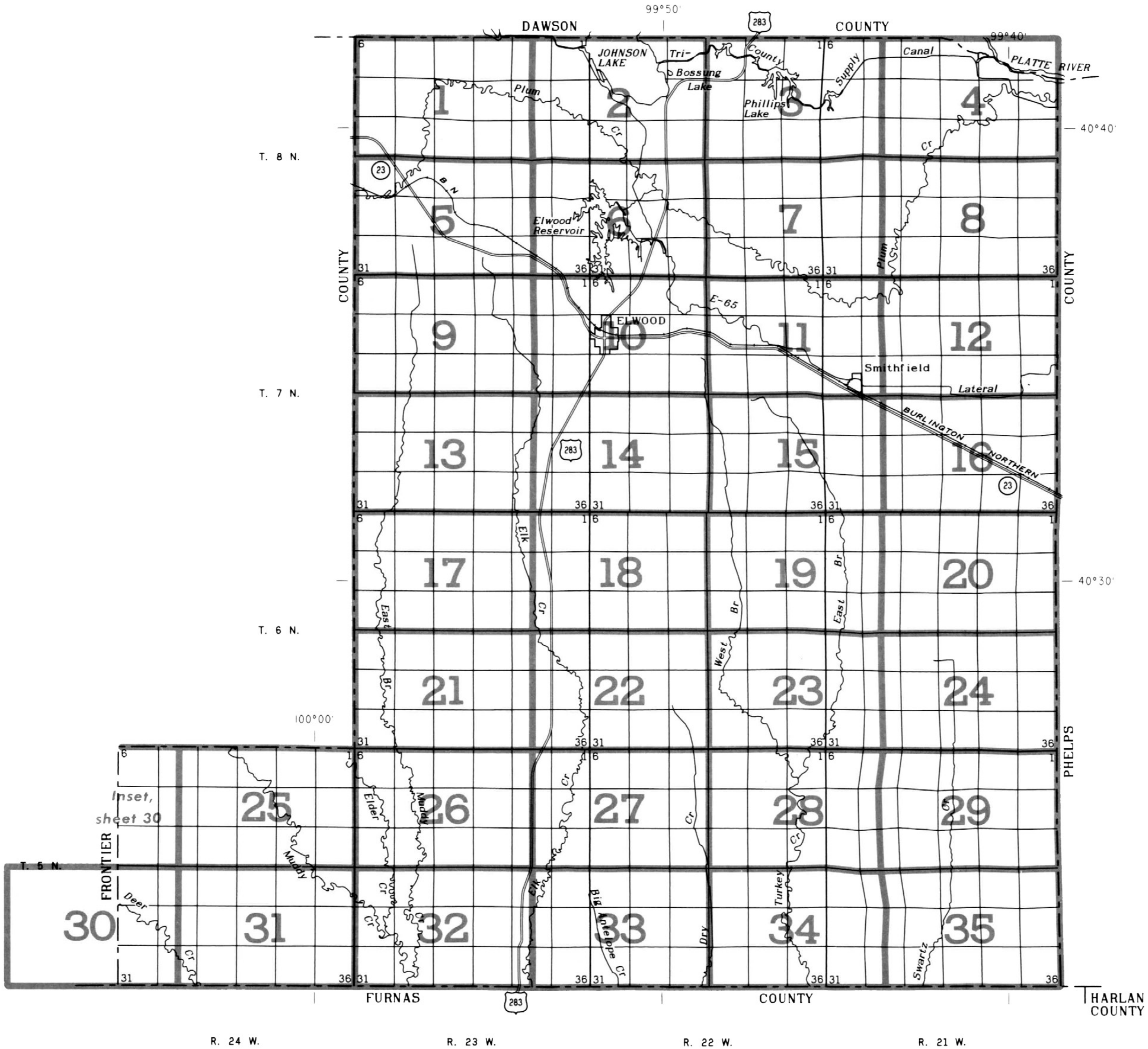
6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

INDEX TO MAP SHEETS

GOSPER COUNTY, NEBRASKA

Scale 1:190,080



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

Map symbols consist of a combination of letters or of letters and numbers. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for those soils with a slope range of 0 to 1 percent or 0 to 2 percent. A final number 2 in the symbol indicates that the soil is eroded.

SYMBOL	NAME
AnB	Anselmo fine sandy loam, 0 to 3 percent slopes
AnC	Anselmo fine sandy loam, 3 to 6 percent slopes
AnD	Anselmo fine sandy loam, 6 to 11 percent slopes
CoD2	Coly silt loam, 6 to 9 percent slopes, eroded
CoE2	Coly silt loam, 9 to 20 percent slopes, eroded
CpG	Coly-Hobbs silt loams, 2 to 60 percent slopes
Cs	Cozad silt loam, 0 to 1 percent slopes
CsB	Cozad silt loam, 1 to 3 percent slopes
CsC	Cozad silt loam, 3 to 6 percent slopes
Fm	Fillmore silt loam, 0 to 1 percent slopes
Fo	Fillmore silt loam, drained, 0 to 1 percent slopes
Go	Gosper loam, 0 to 2 percent slopes
Gt	Gothenburg fine sandy loam, 0 to 2 percent slopes
Ha	Hall silt loam, 0 to 1 percent slopes
HaB	Hall silt loam, 1 to 3 percent slopes
Hd	Hobbs silt loam, 0 to 2 percent slopes
HeB	Hobbs silt loam, channeled, 0 to 3 percent slopes
Ho	Holdrege silt loam, 0 to 1 percent slopes
HoB	Holdrege silt loam, 1 to 3 percent slopes
HoC	Holdrege silt loam, 3 to 6 percent slopes
HpB	Holdrege-Uly silt loams, 1 to 3 percent slopes
HpC2	Holdrege-Uly silt loams, 3 to 6 percent slopes, eroded
Hr	Hord silt loam, terrace, 0 to 1 percent slopes
HrB	Hord silt loam, terrace, 1 to 3 percent slopes
Hw	Hord silt loam, wet substratum, 0 to 2 percent slopes
Le	Lex loam, 0 to 2 percent slopes
Lf	Lex loam, saline-alkali, 0 to 2 percent slopes
Pt	Platte loam, 0 to 2 percent slopes
Sc	Scott silty clay loam, 0 to 1 percent slopes
UbD	Uly silt loam, 6 to 9 percent slopes
UbE	Uly silt loam, 9 to 15 percent slopes
UcF	Uly-Coly silt loams, 9 to 30 percent slopes
UtG	Ustorthents, steep

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool (Davis Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate (79)
- Federal (410)
- State (52)
- County, farm or ranch (378)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water; w)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (GAS)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water; w)
- Intermittent (int; i)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (CeA; FoB2)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

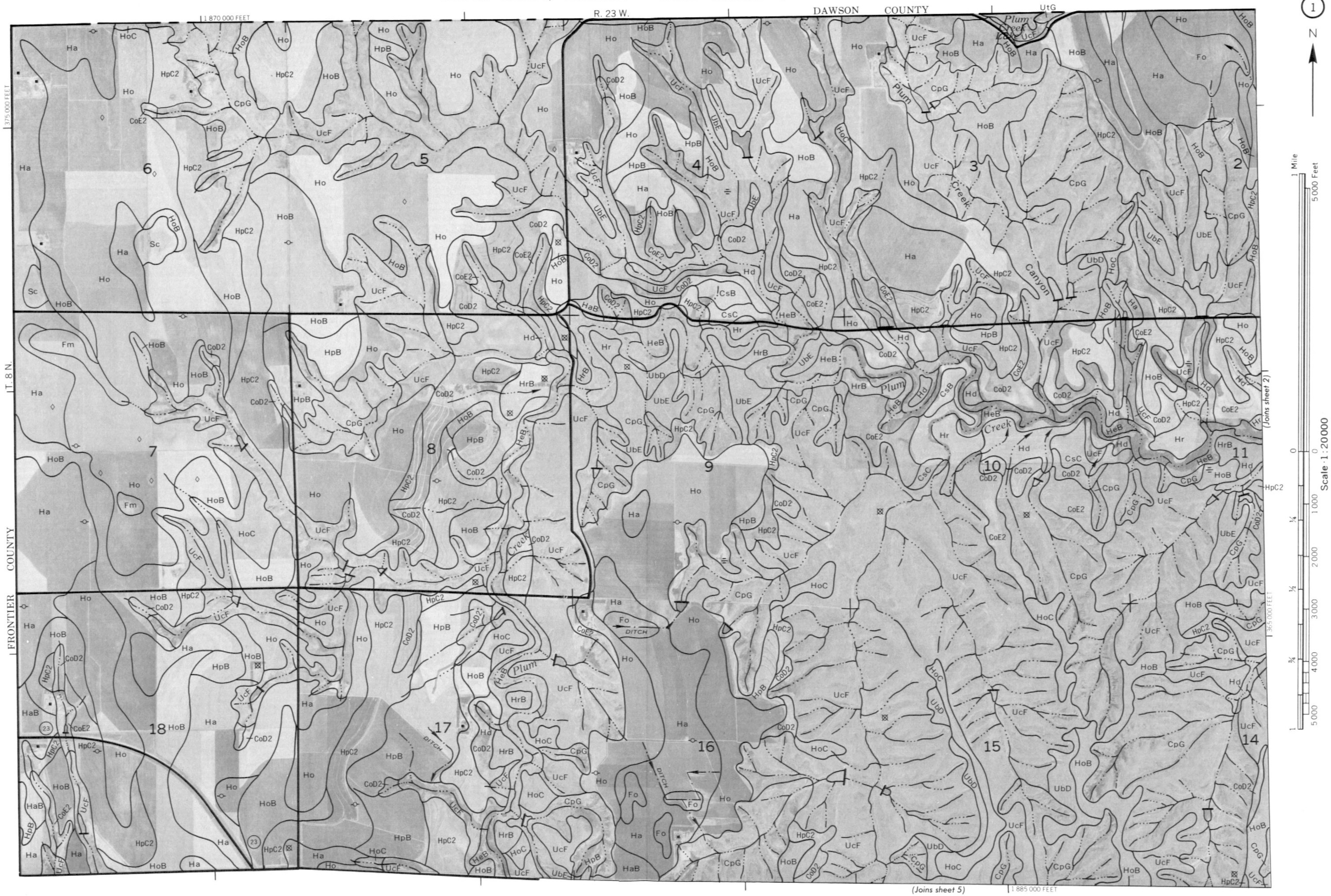
GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Water facility
- Silty outcrop



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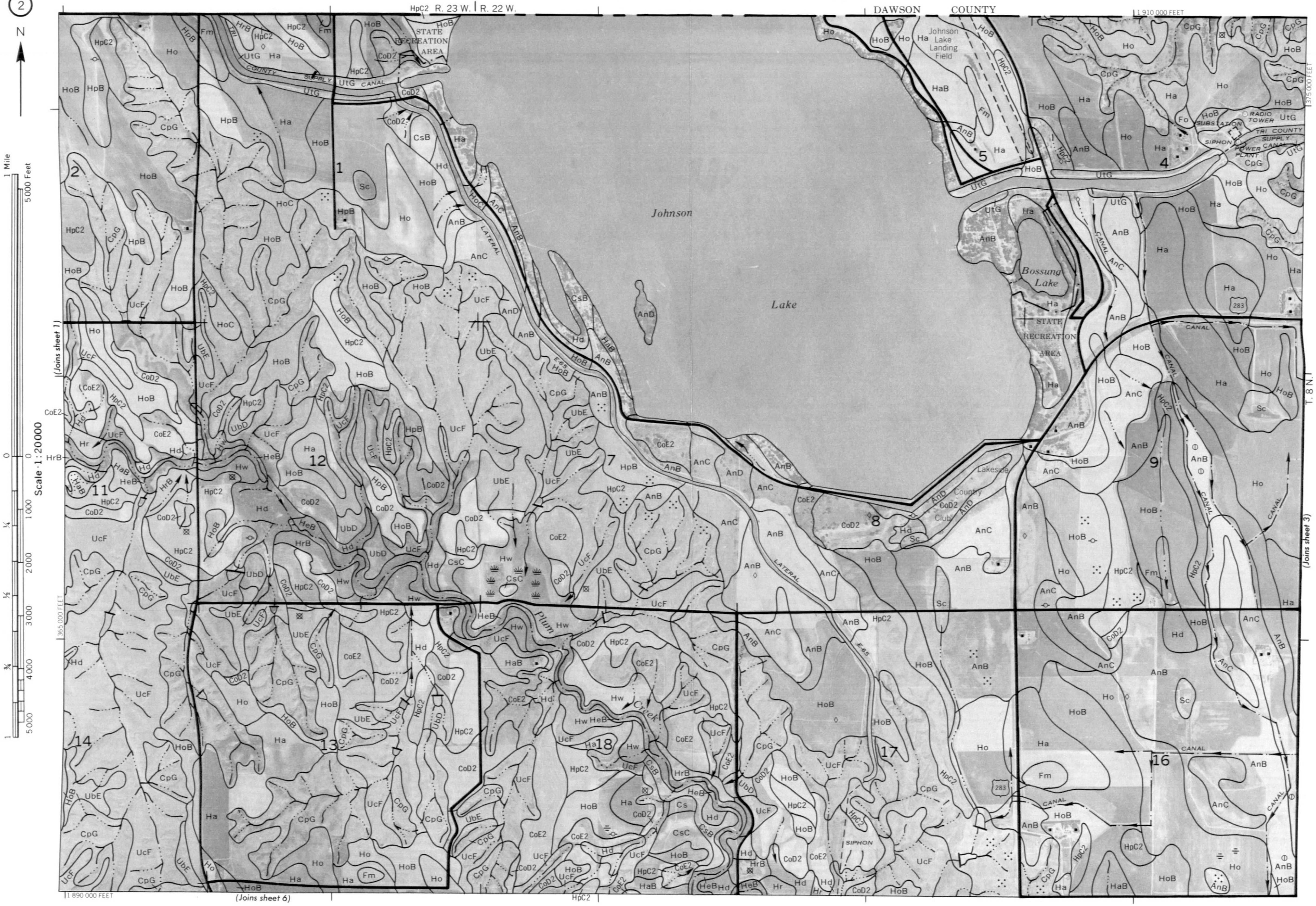

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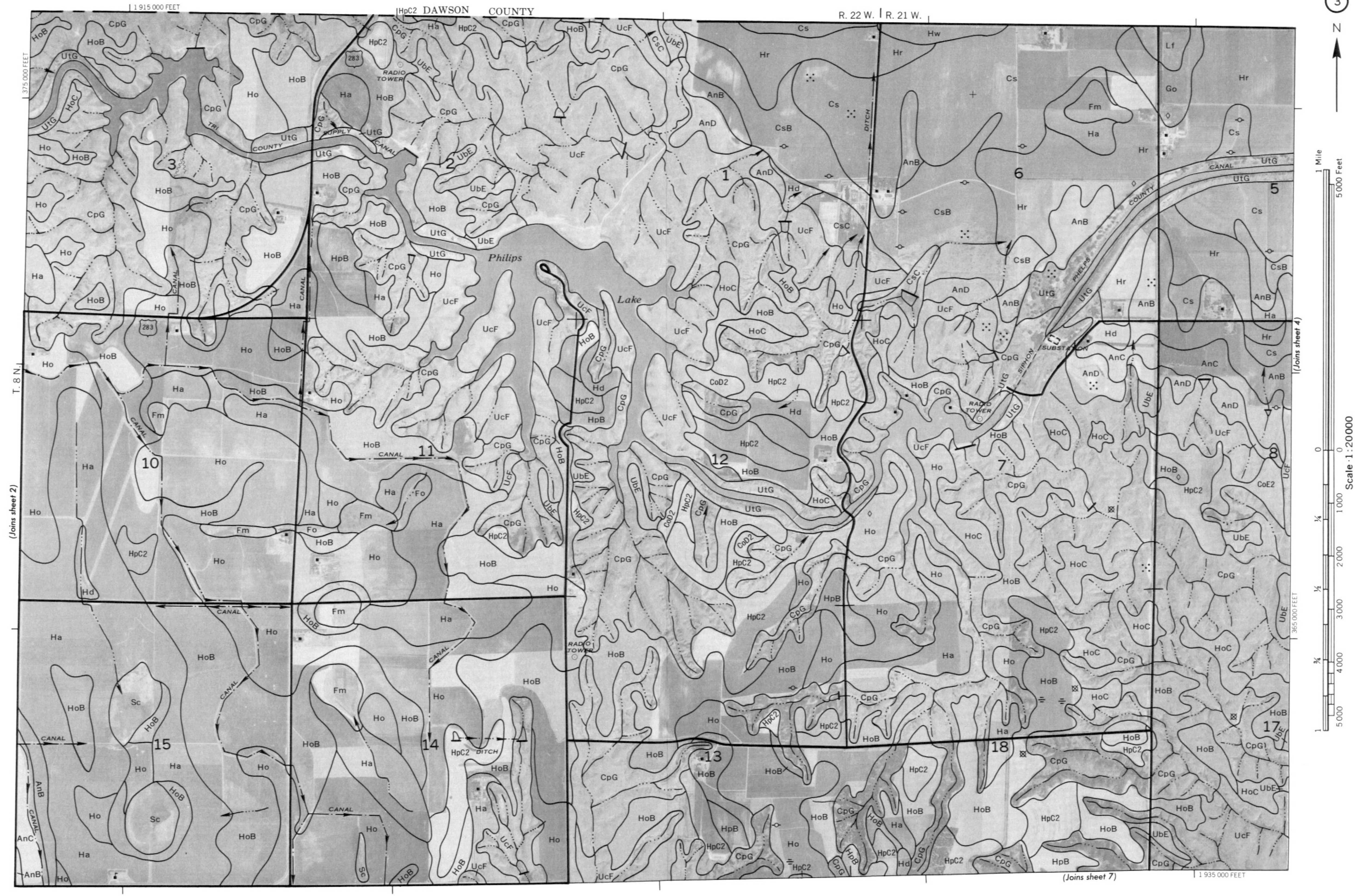

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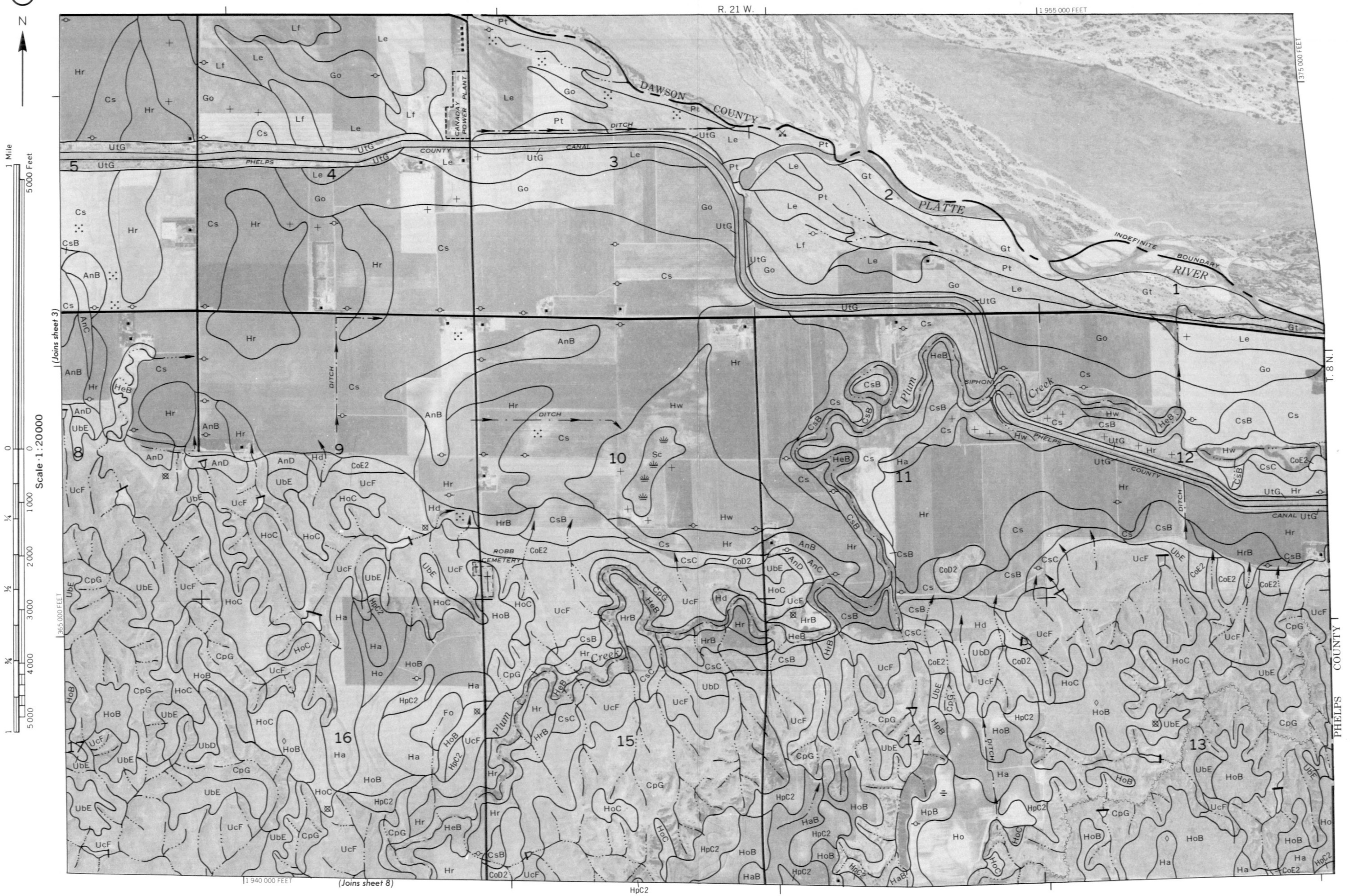
GOSPER COUNTY, NEBRASKA — SHEET NUMBER 4



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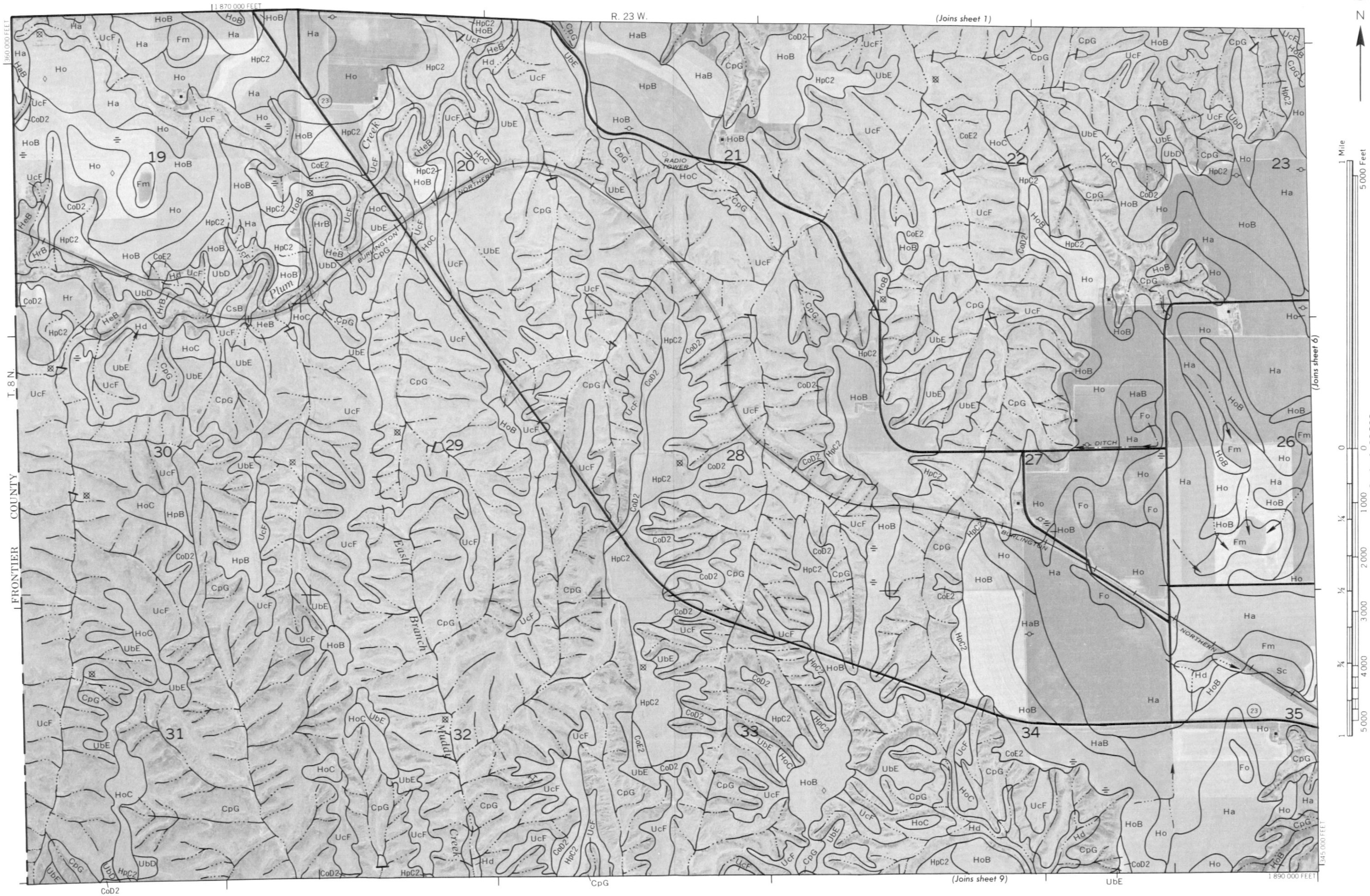

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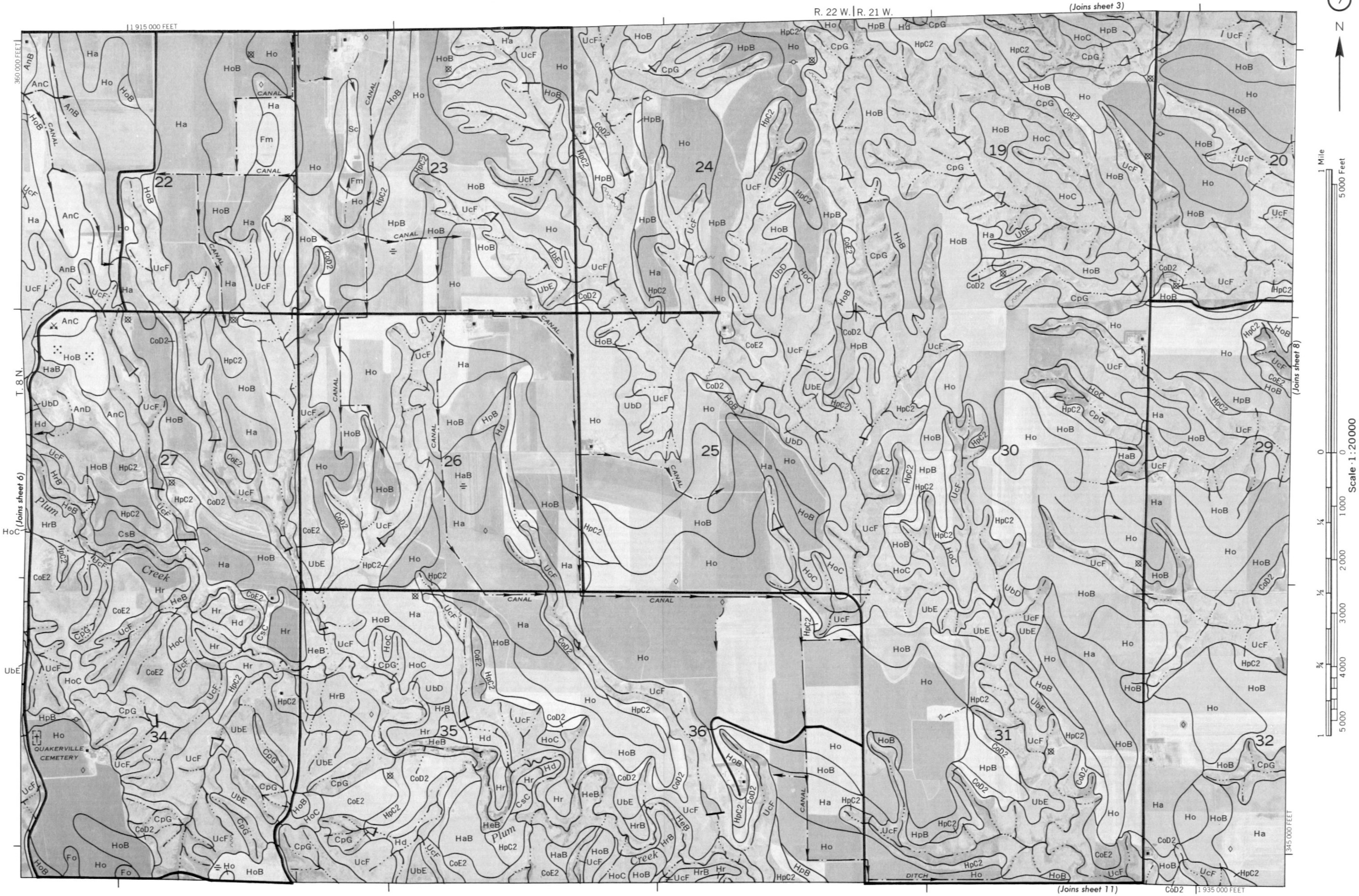
GOSPER COUNTY, NEBRASKA — SHEET NUMBER 7



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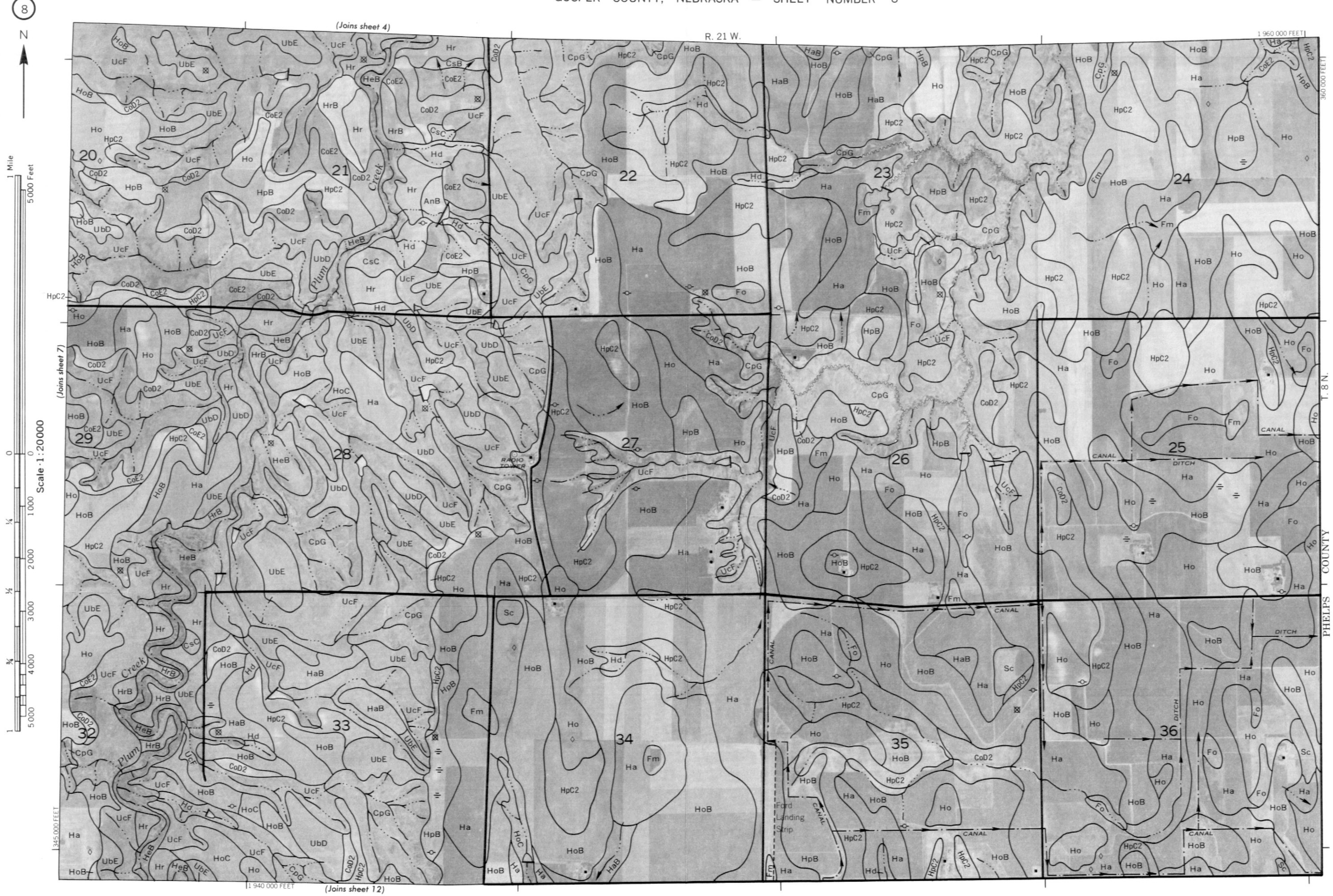

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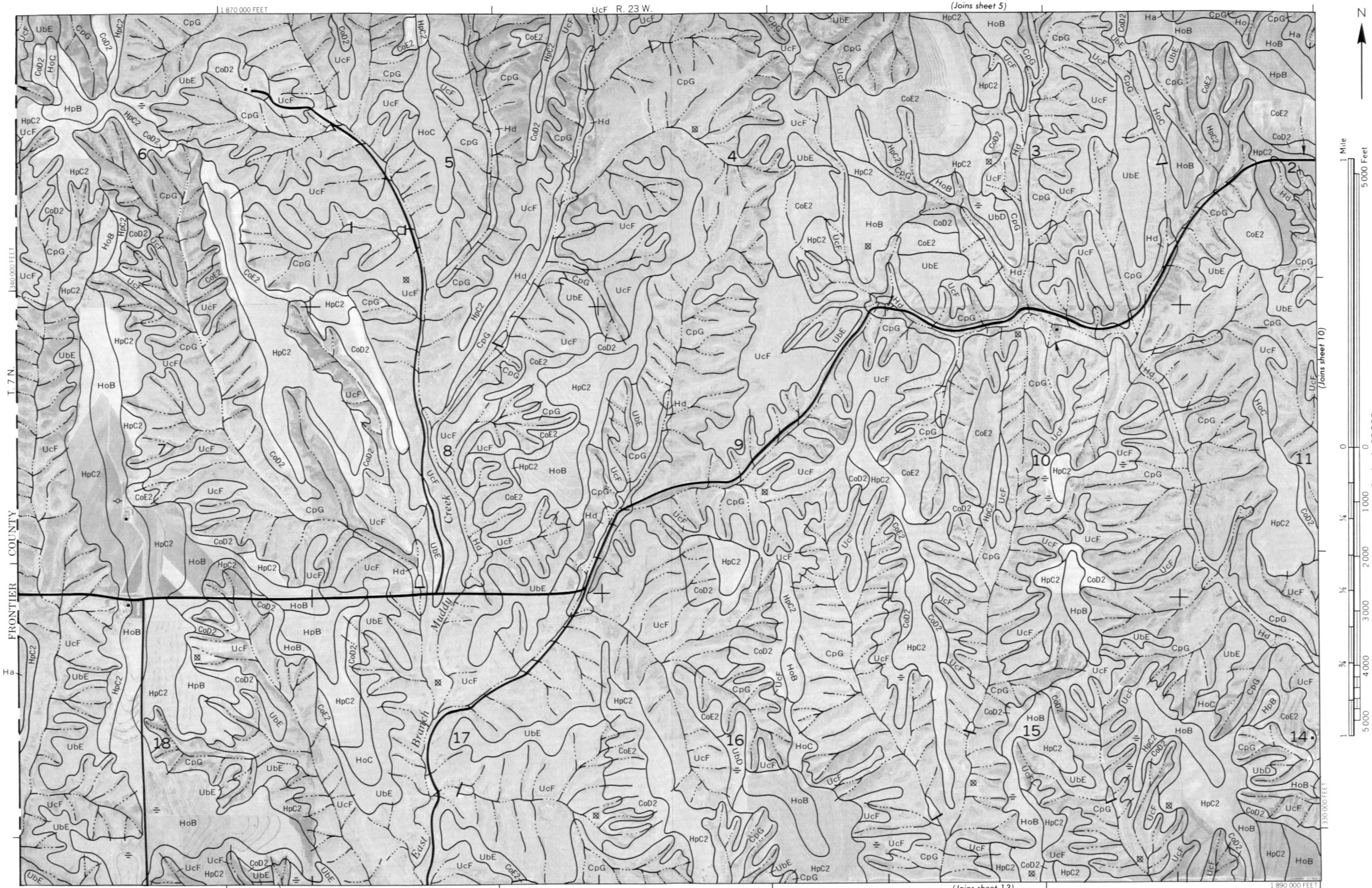

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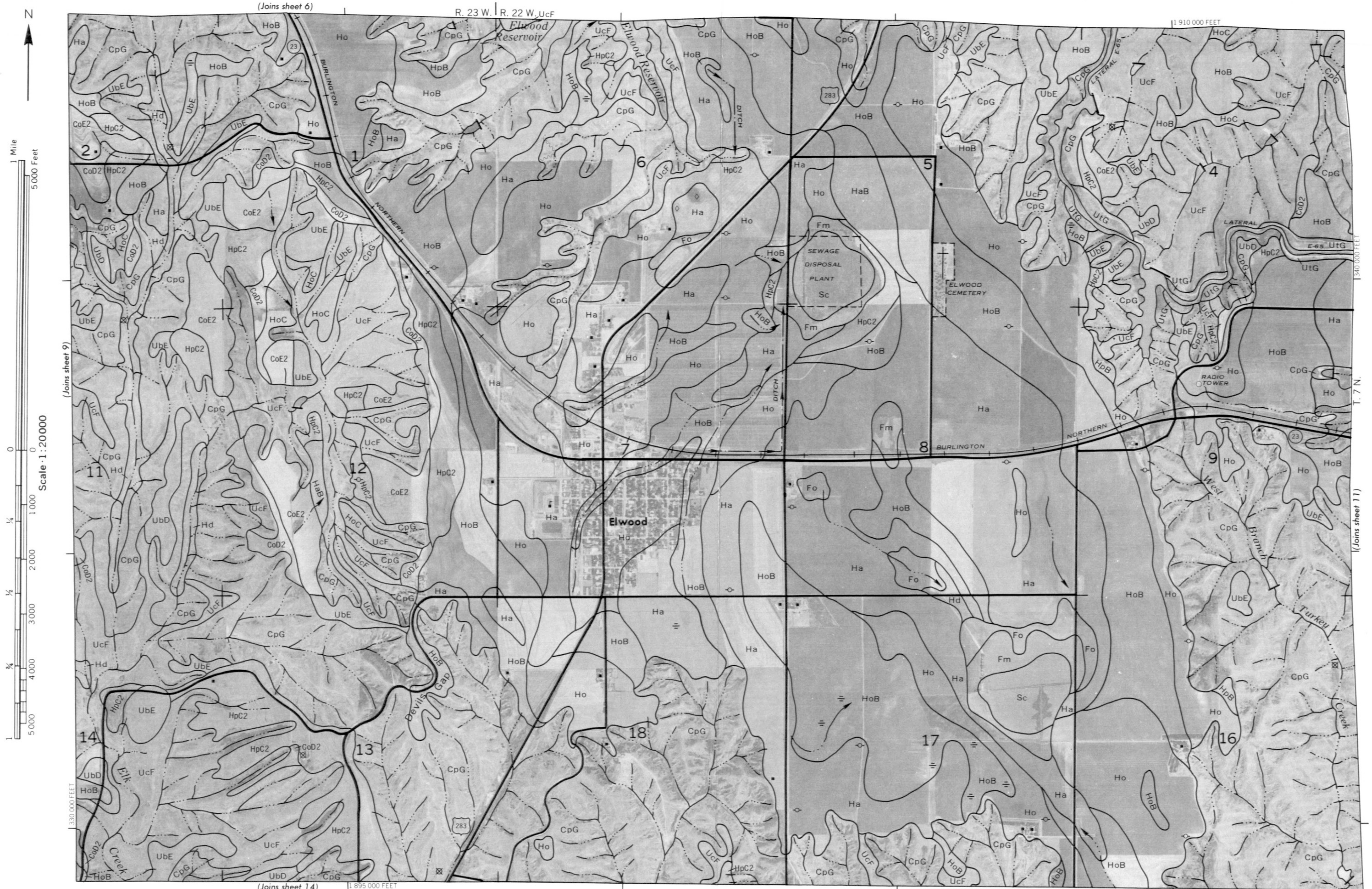

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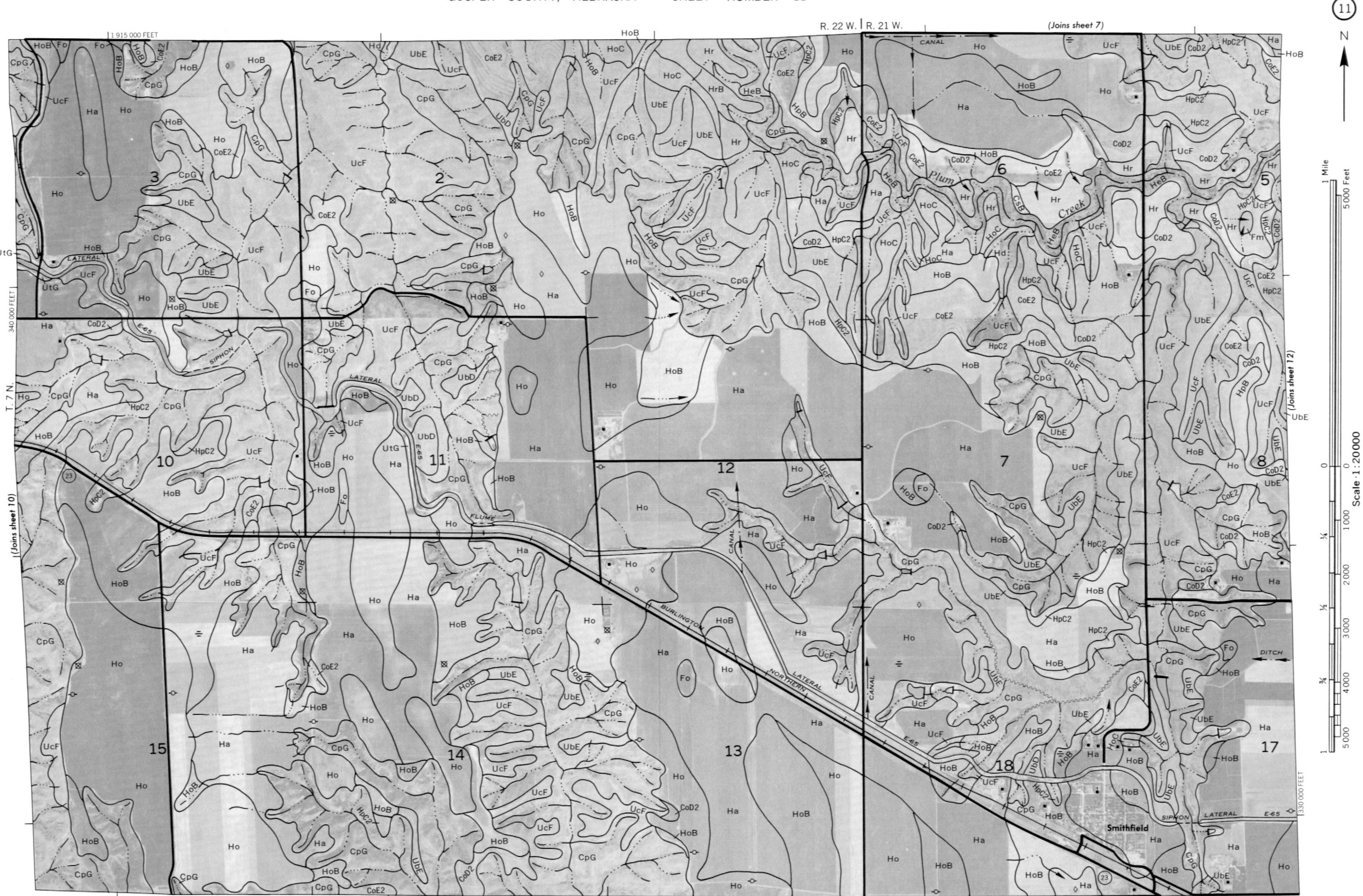
GOSPER COUNTY, NEBRASKA — SHEET NUMBER 11



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GOSPER COUNTY, NEBRASKA — SHEET NUMBER 12

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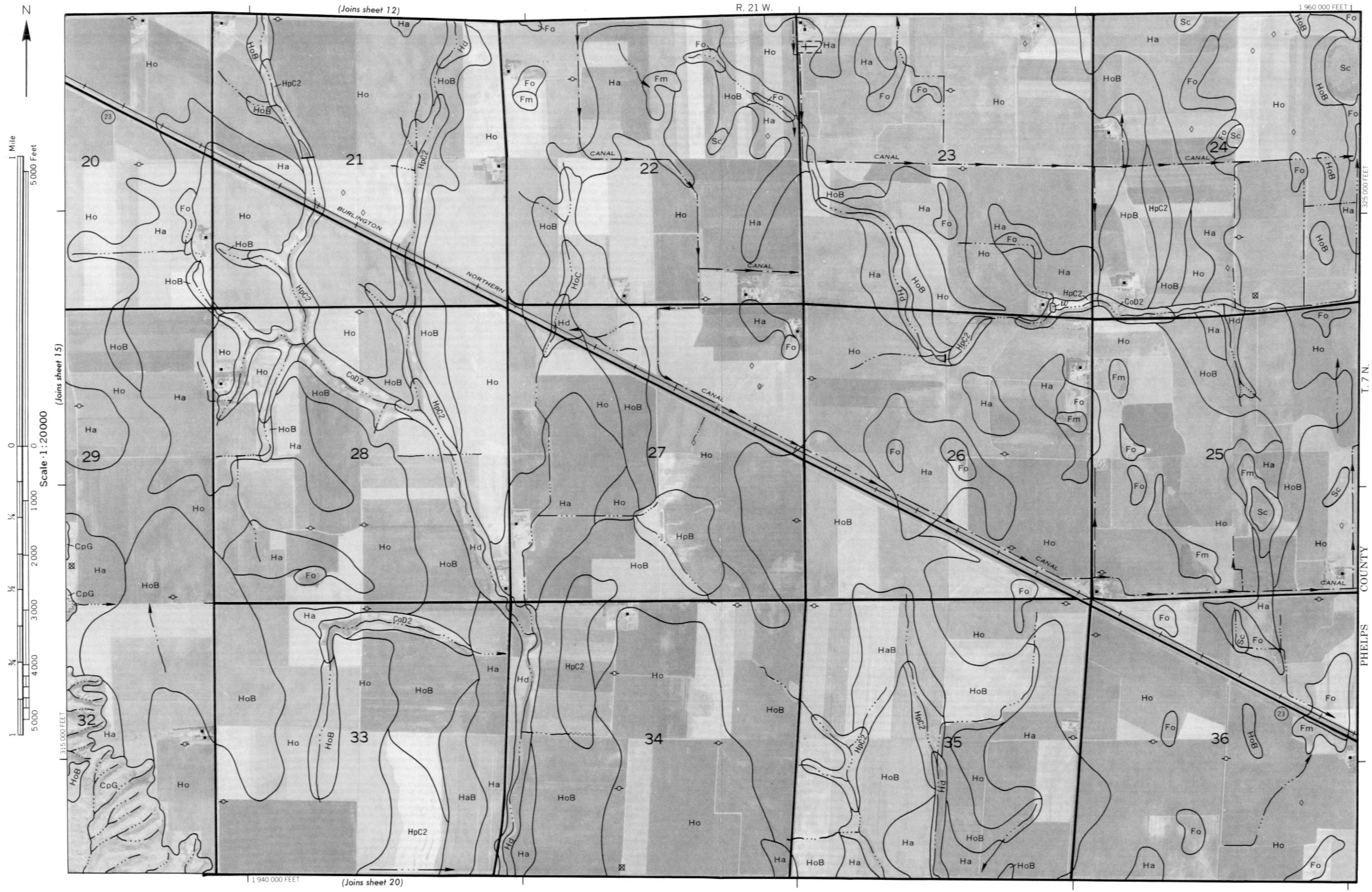
GOSPER COUNTY, NEBRASKA — SHEET NUMBER 16



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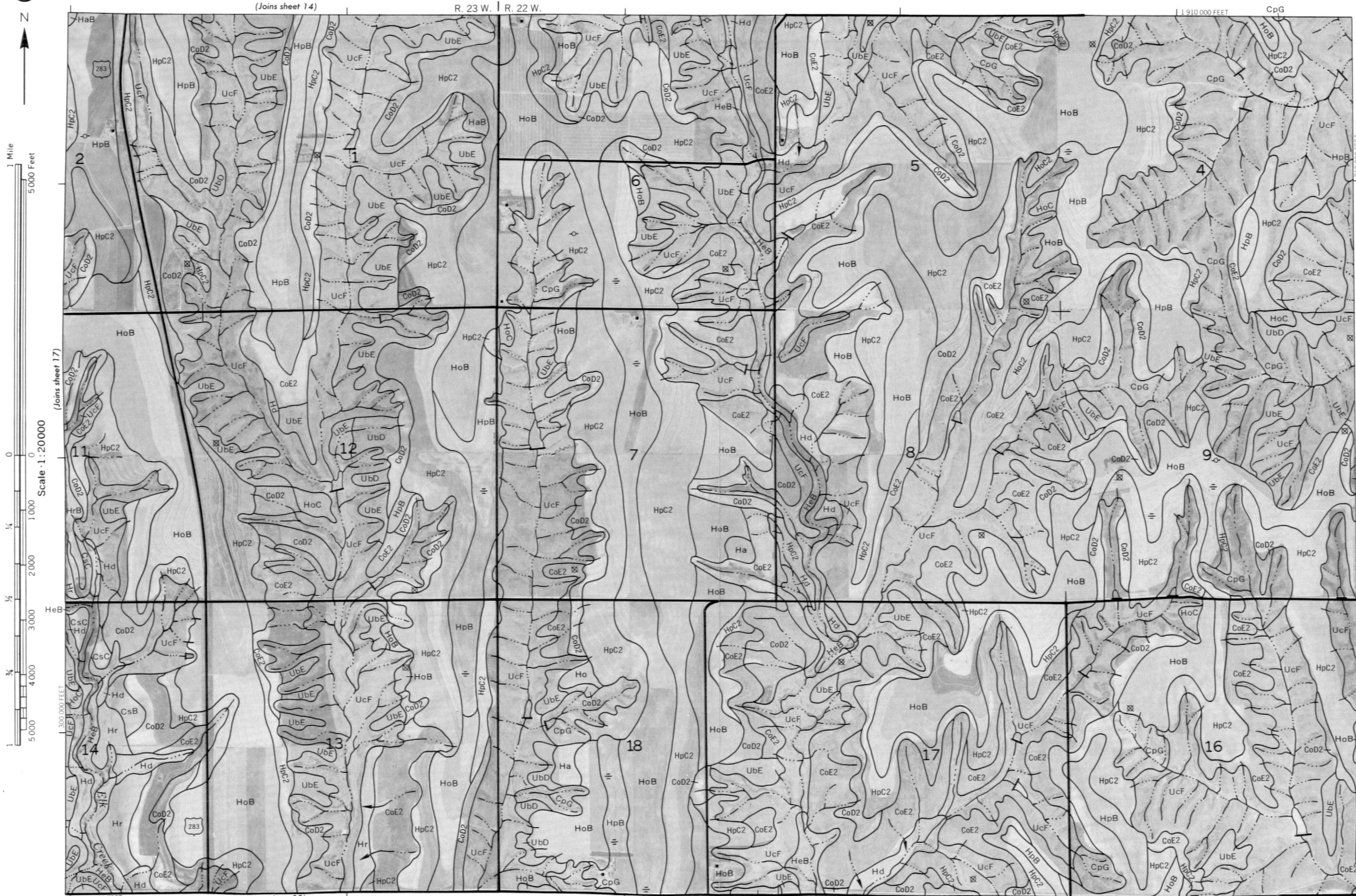
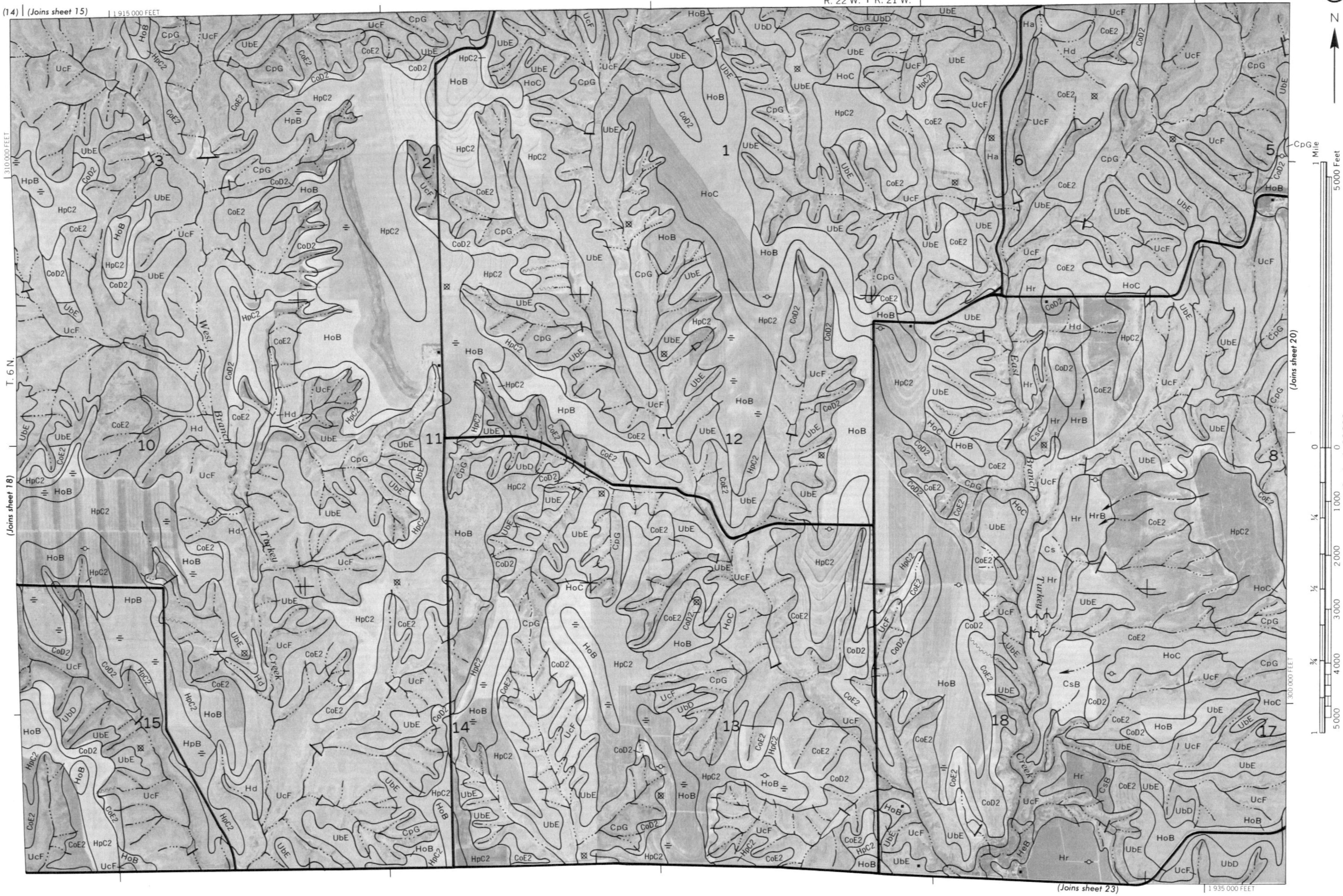
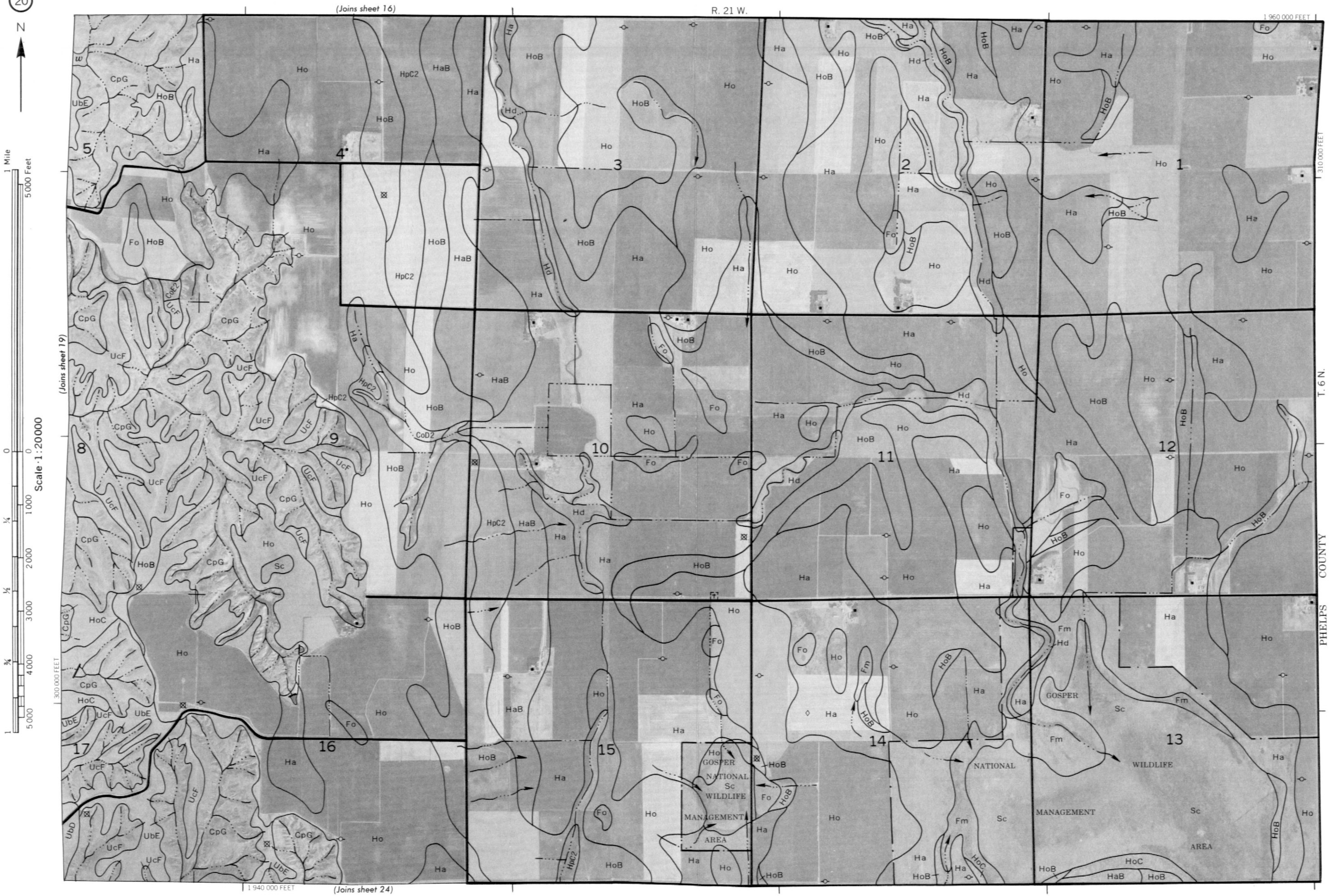
GOSPER COUNTY, NEBRASKA — SHEET NUMBER 18



This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
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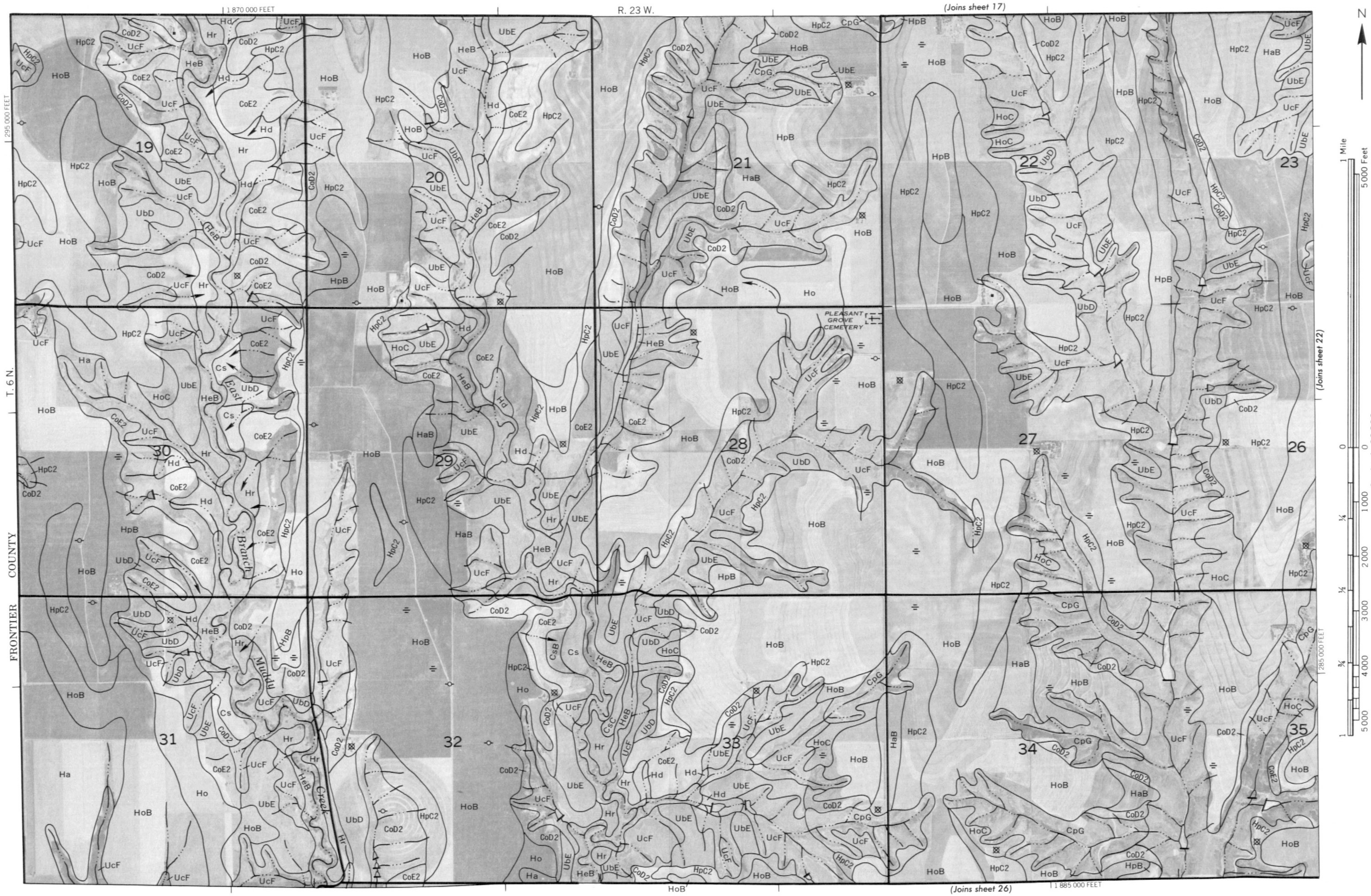
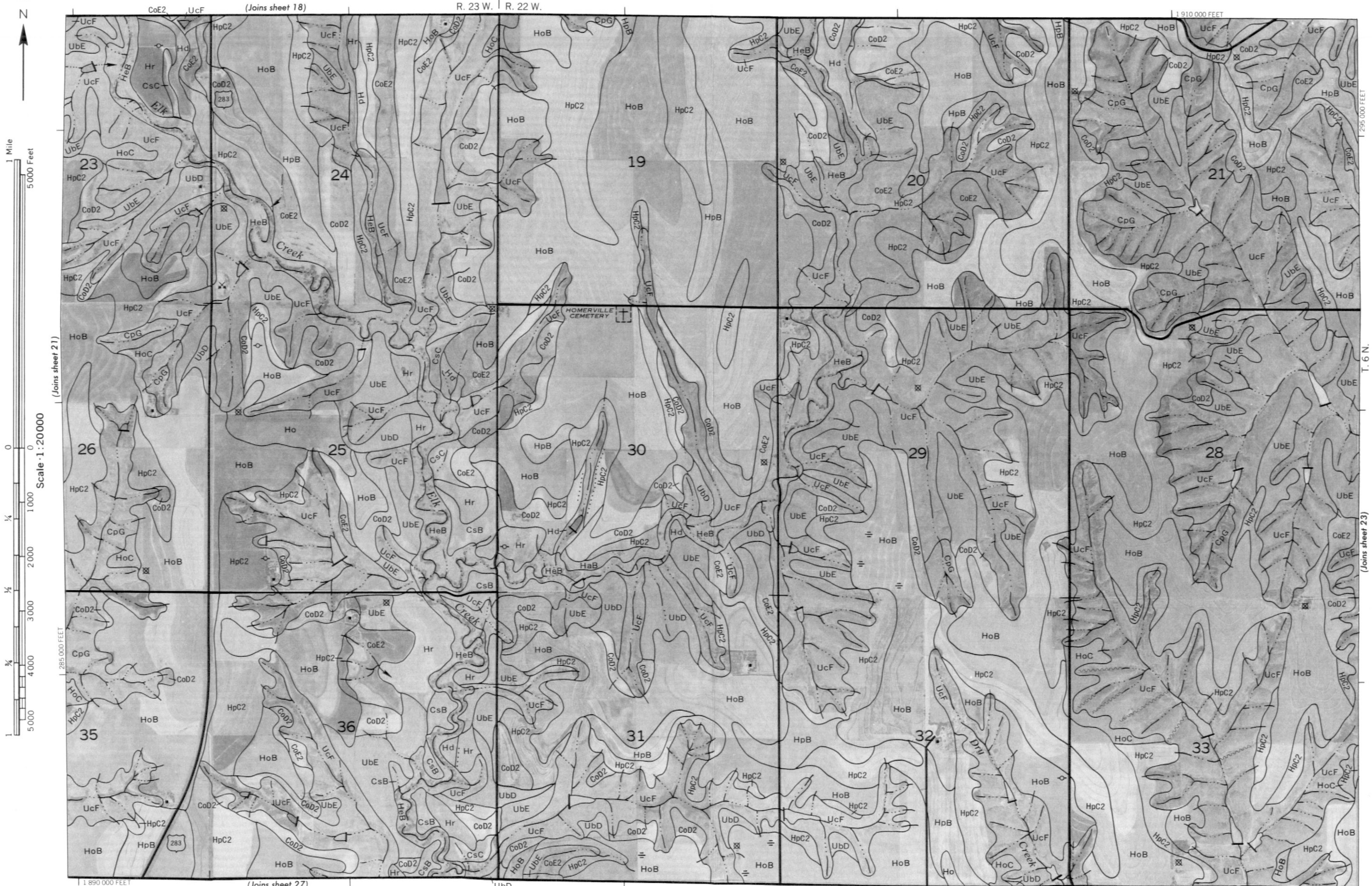
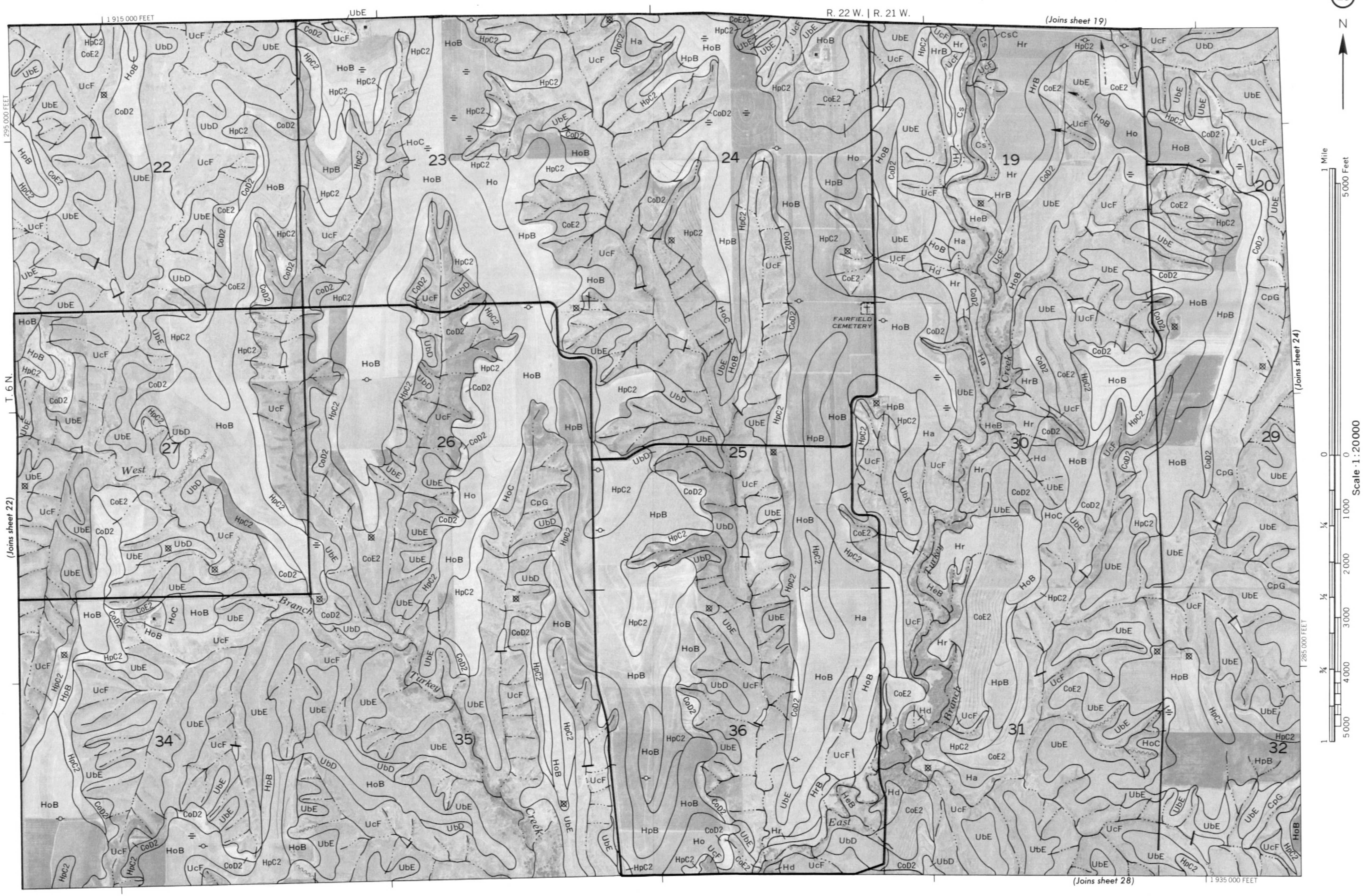


This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GOSPER COUNTY, NEBRASKA — SHEET NUMBER 22



This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

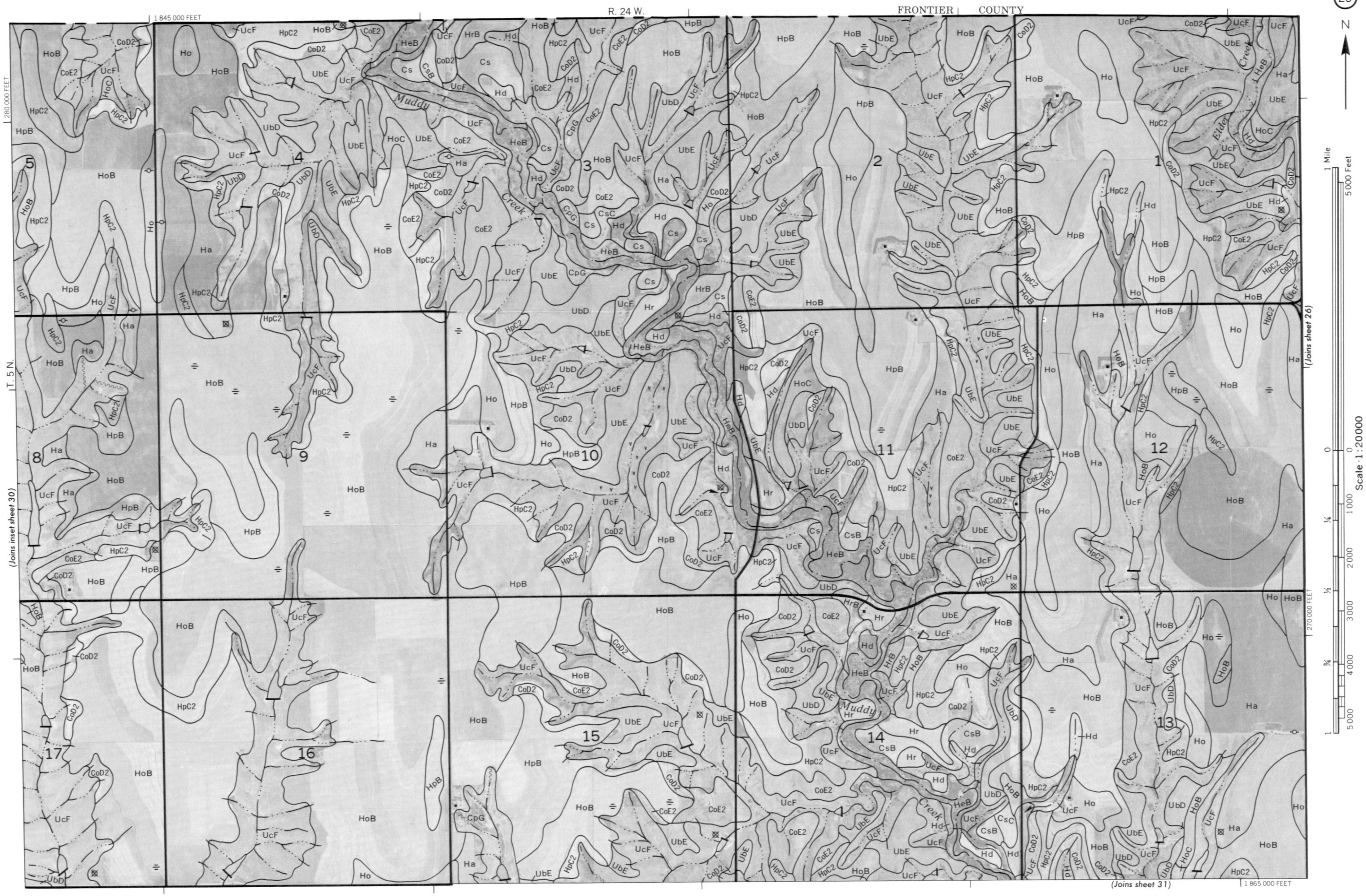


This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GOSPER COUNTY, NEBRASKA — SHEET NUMBER 24

This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

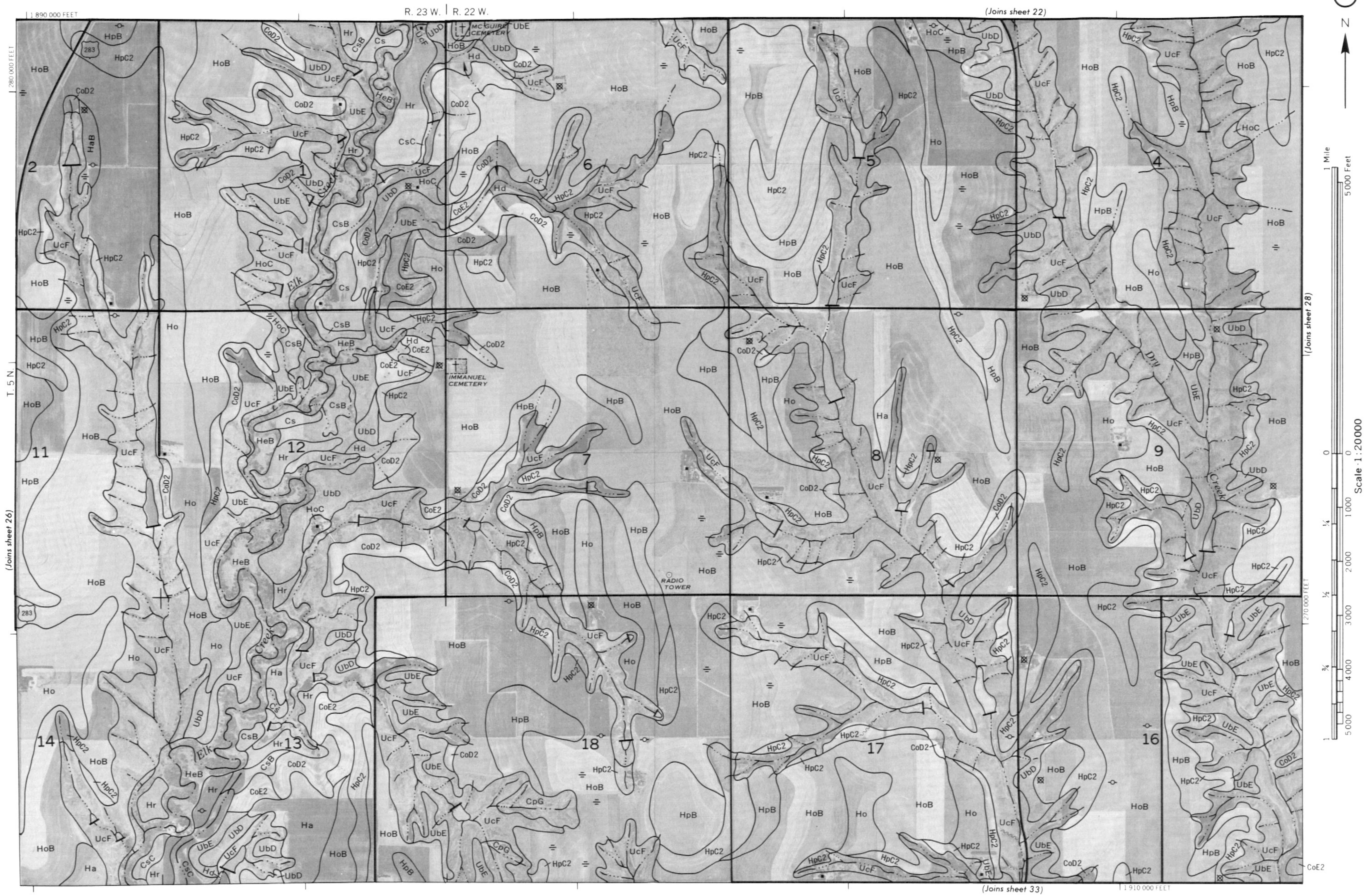
GOSPER COUNTY, NEBRASKA — SHEET NUMBER 25



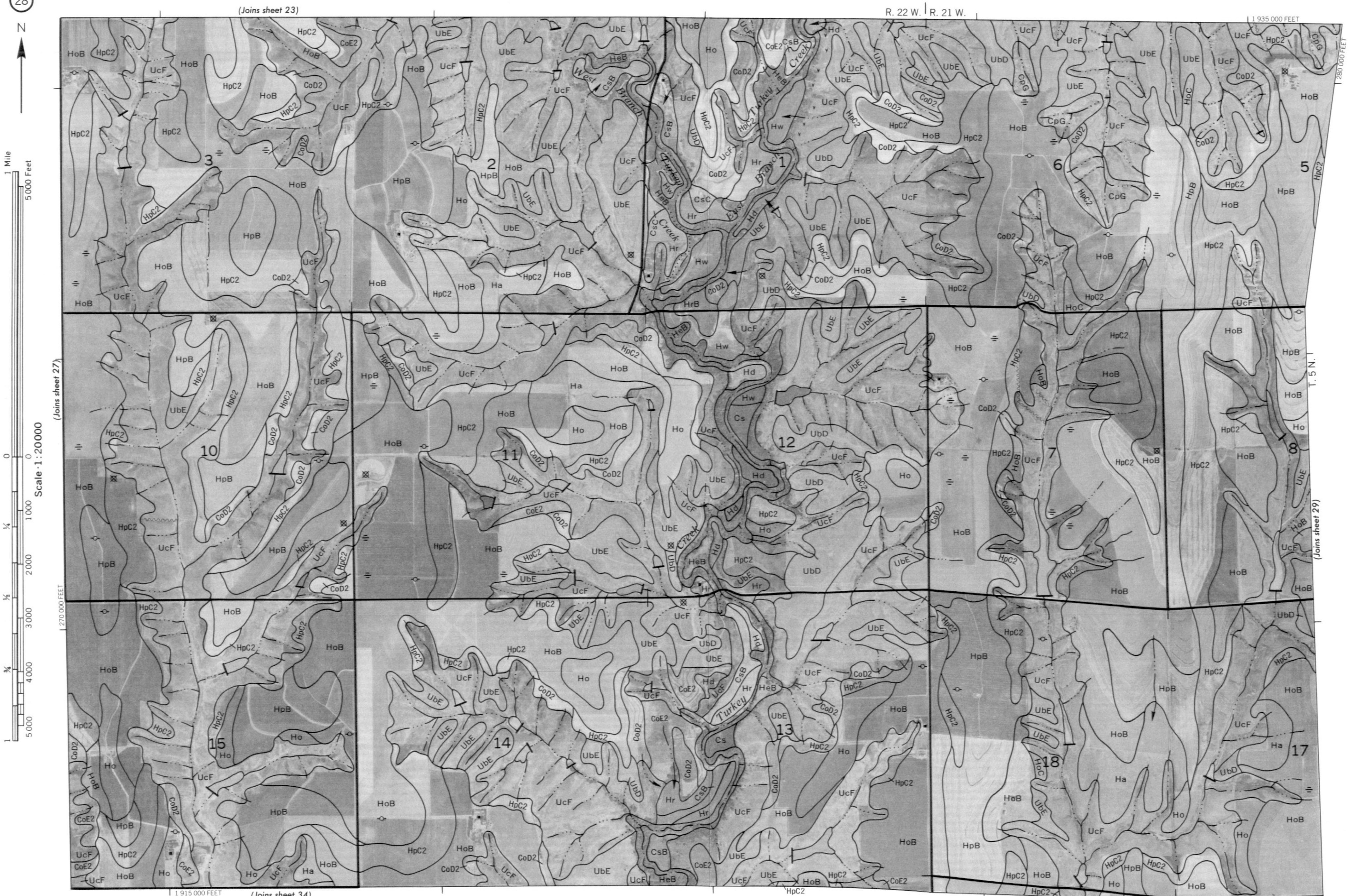
This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GOSPER COUNTY, NEBRASKA — SHEET NUMBER 26

This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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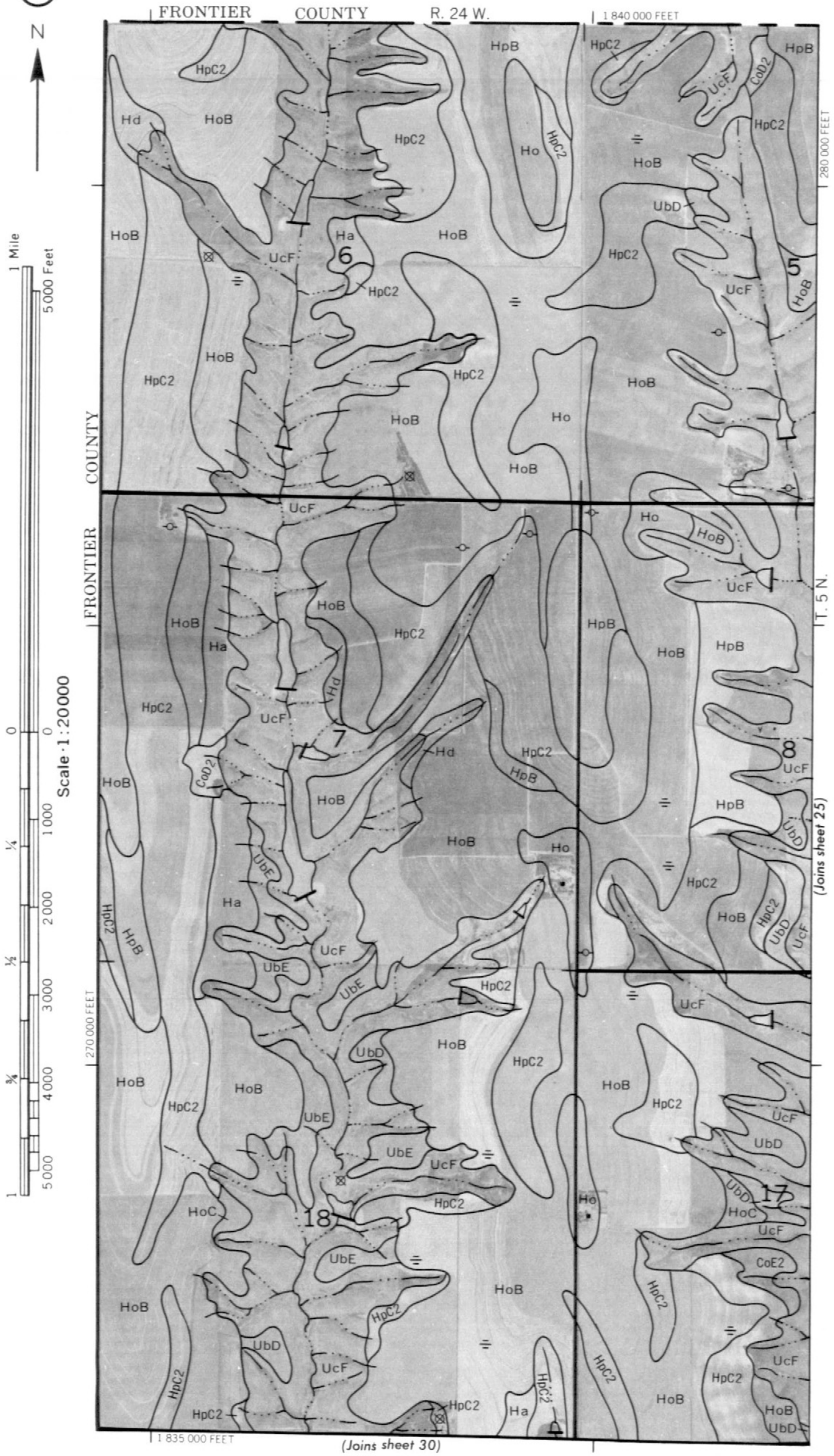

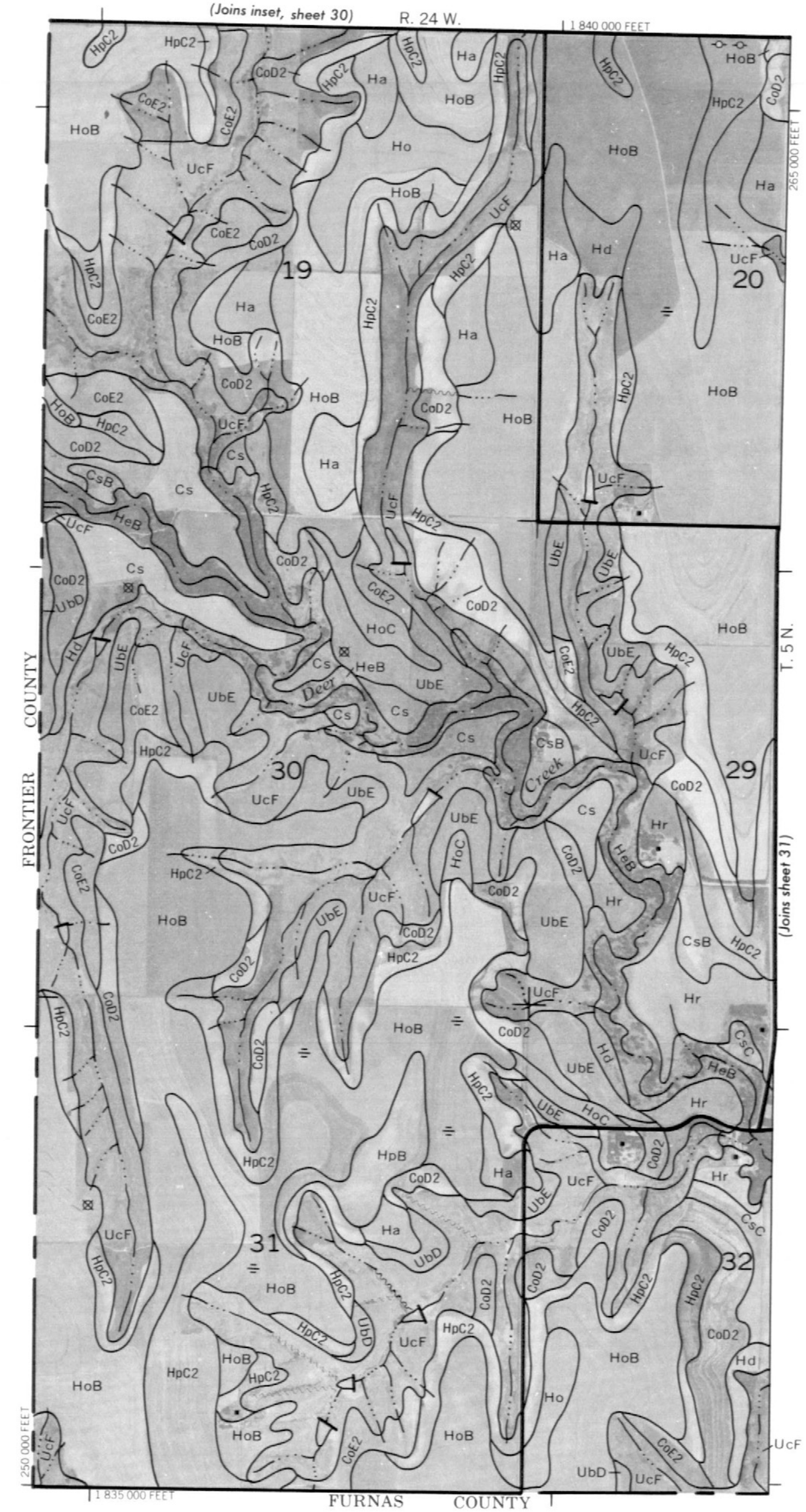

This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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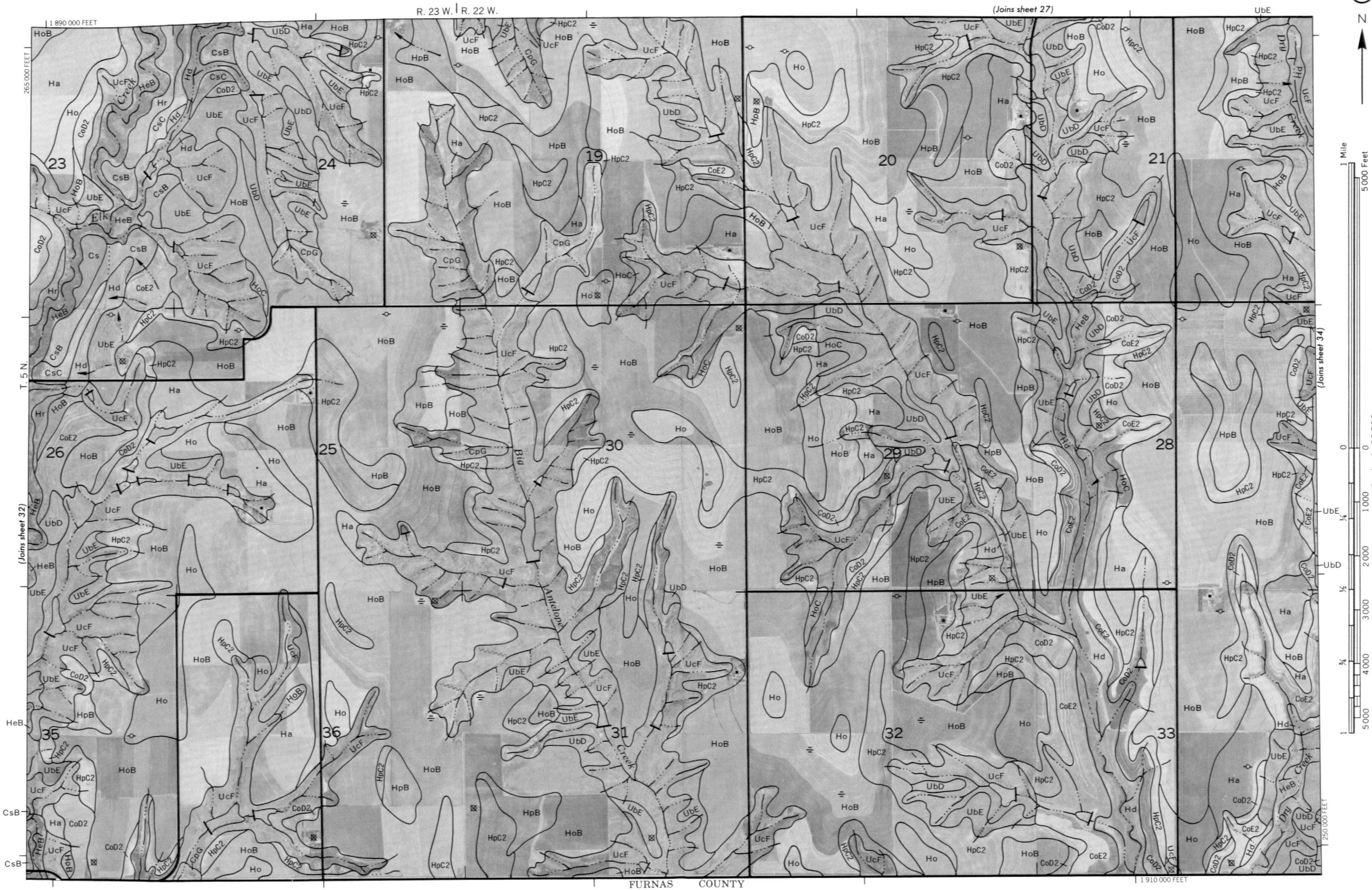

This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GOSPER COUNTY, NEBRASKA — SHEET NUMBER 34

This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.